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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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How to Teach School Children to Sing from Notes.

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DIVISION IV.—STANDARDS V. AND UPWARDS.

Minor Mode—continued.

157. The phrase **r f m** is a good one to use in introducing **fah** in the minor mode. When thus patterned and imitated it should be approached from every note of the minor scale in turn, except from **se**, the leap from which is difficult and demands special study a little later on. The plan of fixing attention upon a scale tone and the tone it most strongly suggests is very useful in teaching **fah**. Thus, the teacher sings a number of little phrases, and the pupils are told to sing **f m** after each phrase.

Example.

Teacher sings— Pupils respond—

| l, : d | m : l, | f :- | m :- ||	
| l, : d | m : l, ||	
| l, : d | m : l ||	
| l, : m | r : d ||	| f :- | m :- ||
| l, : d | m : r ||	
| l, : m | d : t, ||	

If the pupils show any tendency to flatten, a renewed pattern must be given.

158. **Soh** is a rare effect in the minor key. Reckoned upwards from **lah**, **soh** is the seventh note of the scale. It is because **soh** sharp (= **se**) is necessary to modern minor effects, and because **soh** is rarely used, that the two forms of the seventh have come to be named as follows:

soh, the *occasional* 7th.
se, the *essential* 7th.

These names usefully recall the part the tones play in the minor mode. **Soh** is never used freely (i.e., never approached or quitted by leap) in the minor mode, because it so strongly suggests the major mode. It is used simply to smoothen the effect of a scale- or step-wise passage moving *down* from **lah** to **fah**. Unless there is an express intention to mix up major and minor modes in one exercise teachers should make it a rule *never to leap to or from* **soh** *when pointing or constructing a minor mode exercise.*

lah lah
se
soh

fah fah
me me

Exercises on **soh** in the minor mode.

(1) l, d m l s f m
(2) m f m l s f m
(3) l t d' l s f m r d r m m l
(4) m r d l s f m l d' d' t t l

159. **Soh** in the minor becomes difficult to sing when **se** has been heard just before. The contrast of **se** and **soh** may be shown on the plan suggested in sec. 157 above.

Example.

Teacher sings—	Pupils respond—
l s f m l se l l t d' l se se l l d' t l se l, d m l se	l s f m

160. The semitone above **fah** is often used in the minor mode. This sound is regarded as **fah** sharp. It is not usually called **fe** (as is **fah** sharp in the major), because by use the name **fe** calls up its customary connection with **soh**. But, except in a chromatic scale passage, **fah** sharp in the minor is *never* followed by **soh**. It is almost invariably preceded and followed by **me** or **se**. Like **soh**, then, **fah** sharp in the minor is limited in its immediate surroundings. The advantage of a name that can be associated with these surroundings and that will not carry with it conflicting associations, will now be apparent. The syllable **bah** was in use for this purpose for many years, but as some teachers found that the vowel '**ah**' led pupils to want to sing **fah** because of the vowel being the same, the word **bay** is now used. In spelling, this word is abbreviated to **ba** on most modulators, and in printed

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music it is sometimes still further abbreviated to the initial letter 'b.' It should be understood, however, that the official sanction of the Tonic Sol-fa College is given to the pronunciation **bay** in all cases.

lah	lah
	se
soh	
	bay
fah	
me	me

161. As **fah** is the sixth of the minor scale, **bay** is also a sixth, because it is **fah** sharp. But **fah** is commonly treated as a most important member of the scale, whereas **bay** is mostly used merely to smoothen a scalewise progression from **me** to **se**. Therefore, the two forms of the sixth have come to be named as follows:

bay the occasional 6th.
fah the essential 6th.

The term 'occasional' is hardly so appropriate in this case as in describing **soh**, because **bay** is often used in the minor mode.

162. **Bay** should be taught from **me**, thus:

m ba se l

but **doh** must be as soon as possible contrasted with these tones in order that their effect may be properly presented. Otherwise, they will sound like **s l t d'** of another key. The phrase given above should be sung by the pupils after hearing say the following phrases:

Teacher sings—	Pupils sing—
m ba se l	m ba se l
l_1 d m l	
l d' t l	
l s f m	
m f f m	
m r f m	

and easy exercises, contrasting **bay** with **fah** and **doh** should be added.

Easy exercises on **Bay**.

l_1 d m l m ba se l
l d' t l m ba se l
m f f m r d r m m ba se l d' t t l
l d' t l se l l m m ba se l m ba se l
l s f m l s f m m l m l m ba se l

163. It has already been noticed that the Code asks for a *sight-singing* acquaintance with only a restricted minor scale. **Fah, bay** and **soh** are to be altogether excluded, and **se** is to be approached and quitted only as follows: **l se l.**

lah
se
.
.
.
me
ray
doh
te
lah_1

Diagram showing the Code Minor Scale.

(**soh, fah** and **bay** excluded, and **se** to be used thus, **l se l.**)

The framers of the Code instructions seem to recognise quite fully the difficulties that may arise from the use of **soh, fah** and **bay** in the minor. But all the same, teachers will be wise to introduce some *studies* of these tones, if only because even a slight familiarity with them will give greater definiteness of effect to the other tones of the minor scale.

164. The pitching of minor keys calls for special remark. It has been the custom in tonic sol-fa literature to record the pitch of **dohs** only by the statement Key G, key E, &c., and in minor pieces to *add* the pitch of the **lah**, thus: Key B♭ (meaning **doh** is B flat), *L* is G (meaning **lah** is G). Theories apart, it is *practically* the best thing to give the **lah** chord—which, of course, includes **lah** and **doh**—when starting minor key pieces. Therefore, in the following exercises, the pitch of **lah** only is stated.

SPECIMEN CODE TESTS—MINOR MODE.

Lah is A or B.

(1) l d' t l m l se l t d' r' d' t t l
(2) l m r d r m l se l r m d r m l
(3) l d' l m d r m l d' l m d' t t l
(4) m l d' m d' t l m t d' r' d' l se l
(5) l r' d' t l se l r m l se l t t l
(6) d' t l se l d r m d' l m d r m l
(7) l d' t r' d' m l d r l se l d t_1 l_1

The leaps to **r** and the leap **m t** in the above will probably be found difficult.

Range m_1 to **m** with high pitches for lah_1

Lah is F, F♯ or G.

(8) l_1 m_1 l_1 d m r d t_1 r d l_1 se_1 l_1
(9) l_1 d t_1 m_1 l_1 se_1 l_1 r d t_1 r l_1 d t_1 l_1
(10) m_1 r_1 m_1 l_1 d l_1 r l_1 d m r t_1 d m l_1
(11) l_1 d m_1 m r t_1 l_1 m_1 r_1 m_1 d t_1 r d l_1
(12) m l_1 d t_1 m_1 l_1 se_1 l_1 r d t_1 m d t_1 l_1
(13) l_1 m r d t_1 l_1 m_1 l_1 se_1 l_1 d m_1 m d l_1
(14) l_1 d t_1 m_1 l_1 se_1 l_1 m_1 t_1 d r l_1 l_1 se_1 l_1

165. As the major and minor modes are often mixed (*i.e.*, both used) in one tune it is expedient to practise them in close connection. Such mixtures of modes must be made with discretion, otherwise great difficulties will result. The following are submitted as specimens:—

STUDIES IN MAJOR AND MINOR MODES MIXED.

d :r	m :s.f	m :r	s :—	l :se	l :m
r :d.r	m :l	l_1 :t_1.d	r :m	l_1 :se_1	l_1 :—
t_1 :d	r.f :m	m :r.d	l :s	f :m.r	s :d.r
m :r	d :— ‖				

l_1 :t_1 :d	m :— :r	d :— :t_1	l_1 :— :—
d :m :l	s :— :m	r :— :s_1	d :— :—
r :m :f	l :— :s	t_1 :d :r	f :— :m
m :r :d	t_1 :— :r	d :— :t_1	l_1 :— :— ‖

The following Old English tune, known as THE MORRIS DANCE (Moorish dance), quaintly illustrates various 'forms' of the minor scale and a movement to the major :—

Doh is G, Lah is E. *Quickly and strongly accented.*

f

m	:l	|b	:se	|l	:s .f	m	:- .f
s .l	:s .f	|m	:r .d	|t_1 .l_1	:t_1 .d	l_1	:—

p

d .r	:m .f	|m	:r .d	|t_1 .l_1	:t_1 .d	|l_1	:—
d .r	:m .f	|m	:r .d	|t_1 .l_1	:t_1 .d	|l_1	:—

f

d	:d .d	|s_1	:s_1	|l_1 .t_1	:d .r	|m	:- .f
s .l	:s .f	|m	:r .d	|t_1 .l_1	:t_1 .d	|l_1	:—

ff

d	:d .d	|s_1	:s_1	|l_1 .t_1	:d .r	|m	:- .f
s .l	:s .f	|m	:r .d	|t_1 .l_1	:t_1 .d	|l_1	:— ‖

(*To be continued.*)

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Practical Kindergarten Lessons for English Elementary Schools.

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IV.

GIFT I.

GIFT I. consists of an oblong box containing six worsted balls. The balls are of different colours—three primary colours, red, blue, and yellow, and three secondary colours, green, orange, and violet. The box also contains six strings corresponding in colour to the balls, and three sticks of wood which form, when fitted together, the two uprights and cross beam from which the balls may be suspended.

This gift is suitable for the youngest children; for those in the babies' room.

By means of it the children gain ideas of Form, Colour, and Number. While using the ball, they should be carefully taught to use good language with pure pronunciation. Every word suggested must be the exact one suitable for the object in view. Every word uttered must be rendered by the teacher with its purest sound. Thus early are laid the germs of correct articulation, purity of language, and freedom of expression.

In the various exercises with the balls the muscular development of the children is carefully attended to, the games bringing the muscles into play, and aiding their development.

Habits of order and precision are inculcated, and the powers of comparison, attention, and observation, exercised and excited.

The games and exercises with the ball are numerous and varied.

The teacher, bearing in mind that the children who use this Gift are 'babies,' must carefully keep in sight that a great deal of repetition will be necessary.

To show more clearly the use of this gift the following examples of lessons or plays are given :—

N.B.—During the early lessons the children should only have one ball each, but in subsequent lessons this number should be increased to two, three, four, five and six.

The ball may be given to the children either free, *i.e.*, without the string; or suspended, *i.e.*, with the corresponding string attached to it.

The children may be exercised with either of these balls. The suspended ball is principally used for giving ideas of motion, such as rolling, drawing, swinging, twisting, &c.

1st Lesson.—Aim. To introduce the ball to the children. To make them familiar with its general characteristics.

To teach them correct pronunciation, and to increase their use of language.

Method. The children are to be provided with one ball each. The balls should be distributed by the children passing them from hand to hand: this gives the teacher the opportunity of inculcating the habit of order, of teaching the children to pass things quietly and gently, and of making them polite to each other.

When each child has a ball let him place it in front of him; the teacher should then begin to question the children, taking care that her questions are simple and pointed, and that her manner is pleasant and encouraging.

'Now, little ones, what are we going to play with this morning?' 'Our balls.' 'Do you see that I also have a ball? Well, I am going to hold my ball up. Now you all do the same, and then say, "We are all holding up our balls." I want you all to look at your balls. What can you tell me about them?' 'Round.' 'Yes, but I want you to say more than "Round;" you should say, "Our balls are round." Well, Lily, what can you say about your ball?' 'Soft.' 'Now, children, what should Lily say instead of "soft"?' 'My ball is soft.' 'Yes; or she might have said, "It is soft."' All the children should then be directed to feel their balls, and afterwards repeat, 'All our balls are soft.' 'Look at your balls again and try to tell me of what they are made. Well, what are you going to say?' 'Our balls are made of wool.' 'I should like Mary to tell me something about her ball.' 'Blue.' 'But, Mary, you can say something better than "Blue."' 'My ball is blue.' 'Oh, that is much better.' Mary should then hold her ball up so that it can be seen by all the class, and the children should repeat, 'Mary's ball is blue.' The teacher should then ask the children to look at their balls, and those who have balls like Mary's should be asked to hold them up. Of course several children with other coloured balls will hold them up. These should be directed to place theirs by the side of Mary's, to notice the difference, and then be told to put

them down. In this way the children would be led to notice that all their balls were not alike, and they should repeat, 'Our balls are not all of the same colour.' 'Now, who can tell me all we have found out about the balls? Repeat "Our balls are round," "Our balls are soft," "Our balls are made of wool," "Some balls are blue."' This would be found sufficient for one lesson; the balls should be returned, being passed in the same way as at the beginning of the lesson.

2nd Lesson.—Aim. To teach the children to distinguish between their right and left hands, and the value and use of such words as *in*, *on*, *upon*, *under*, *over*, &c., and also the position designated by these words.

Method. The balls to be distributed to each child as before, and the children to be questioned as to what they learnt about the balls the last time they saw them.

'Now, see what we are going to do with these pretty balls to-day. How many hands have you? Hold them both up. Now put them down again, and then hold up the one nearest to the window. Now hold up the other one. We have different names for these hands. Which of you can tell me the name of the one nearest the window? Yes; it is the right hand.' The children should then be asked to hold up their right hands, and should then repeat, 'We are holding up our right hands.' 'Now, put your right hand on your head and say, "My right hand is on my head."' The children should then be told to take up their balls with their right hands and repeat, 'My ball is in my right hand.' 'Now, hold up the other hand. Do you know what name we give to it? You are right, Mary; it is called "the left hand." Now all of you say, "We are holding up our left hands."' Much the same exercises should be done with the left hand as were done with the right.

'Now tell me in which hand John has his ball.' 'In his right hand.' The teacher then taking the ball in her right hand should put her hand over her head and ask the children to tell her the position of her right hand. 'Now take your ball in your right hand and put your hand over your head and repeat, "My ball is in my right hand over my head."' The teacher then holding the ball over the table would say, 'Where is my ball now? Hold your balls over the table and repeat, "My ball is over the table." Now hold your balls over something near you. Where is yours, Jane?' 'Over the chair.' The class to repeat, 'Jane's ball is over the chair.' 'Now take your balls in your right hands again and hold them over your left hands, and each repeat, "My ball is over my left hand." Now take your balls in your left hands and hold them over your right hands and say, "My ball is over my right hand."' By similar exercises the meaning of the following words *on*, *upon*, *under*, *beneath*, *inside*, &c., would be taught. The balls should now be passed to the teacher, and put carefully away in the boxes.

3rd Lesson.—Aim. To teach one of the primary colours, such as blue.

Method. The balls having been passed round the class as before, the children should be asked to say all they can about them. Their attention should be directed to the different colours of the balls. 'Each of you who has a blue ball hold it up. Now look at Tommy's ball and tell me if that is blue?' 'No; it is not.' The teacher should then direct one of the children who has a blue ball to put it beside Tommy's, and after he has noticed the difference in colour he should be told to put his ball down. 'I see there are several children without blue balls. Now each one come to me and you shall pick a blue ball out of this box.' After carefully correcting the mistakes that will be made in picking out the wrong coloured balls, the teacher would say, 'Hold your balls in your right hands and say, "I have a blue ball in my right hand." "We all have blue balls." Can you see anything in the room that is of a blue colour besides your balls? Quite right; Susan's dress is blue, Harry's ribbon is blue. Sometimes when you are walking in the street and look up at the sky you will often see some blue. On what kind of day do we generally see the blue sky?' 'On a nice fine day.' The teacher, producing a board with many colours on it, should ask some of the children to point to the blue. The children then to be asked to name all the things they know that are of a blue colour.

4th Lesson.—The Suspended Ball. *Aim.* To teach the ideas of swinging, drawing, winding, &c.

Method. The balls having been distributed as before, the children should be asked to name the different colours, and afterwards to pick out from the boxes the corresponding coloured strings. The teacher, after showing the children how to fasten the string to the ball, should get them to fasten their own. The teacher then, holding the string, should let the ball swing, and get the children to do the same. 'What are all the balls doing?' 'They are swinging.' 'Have you ever seen anything else swing?' 'Sometimes boys and girls swing.' 'Well, let us think that the ball is a little girl, and let us make her swing—that is right. But you must not swing too fast or too high. Do you like going very high when you are swinging? No; you must not go very high or you might fall. Why does not the ball fall? Are you held like the ball? Now let your ball swing very gently like mine, and tell me what you have seen swinging gently from side to side. Yes; it is the part of the clock called the pendulum. What does it say?' 'Tick, tick.' 'Now all swing your balls, and say, "tick, tick."' The other motions should be similarly explained.

5th Lesson. Songs and plays with the ball.

The balls having been passed and the children having been questioned about them, the teacher should put her hands together and place the ball in the centre of them. The children should then be directed to do the same. The teacher should then sing:

'My little ball is lying here
Within my hand so still.
I'll rock it now it is so dear,
And guard it from all ill.'

The children while repeating this are to suit the actions to the words—thus, when they sing 'I'll rock it now,' they should move their hands to and fro.

The sentence 'Guard it from all ill' should be carefully explained to the children. 'What do we have to rock? You do not know. Well, what have you seen your mother rocking? Let us think the ball is a little baby. You must be very careful, then, when you rock it, or you will hurt it. If you rock it too hard what will happen? Do you ever have to rock your baby at home? Where is baby when you rock him? What

shall we call our hands then? Now let your balls lie still; now rock them; and now you may sing that song again, and then you shall sing another.'

'While little baby lies before me,
How very quiet I must keep.
I'll gently rock it in its cradle,
And try and send it off to sleep.'

During the course of this lesson it is expected that the teacher, while interesting the children, will ask them concerning the way their mothers treat the baby; how they can help their mothers by keeping quiet when baby is asleep, and how they can help to get baby to sleep by rocking the cradle, &c.

'Now, children, to-day we are going to have another song, and I want you to show me how nicely you can sing.'

'Do you see this little nest,
Inside which the birdies rest.
Do not touch it, this I pray,
While the birds are far away
Finding food on which to live.
Do not touch it, this I beg,
For t'would spoil the pretty egg,
Which warm and snugly here is lying
Waiting for the homeward flying
Of the birds to their soft nest.
If they find that all is right,
It will give them great delight
To sing to you a pretty song
That will please you all day long.'

The children should make a nest with their hands or handkerchiefs; the very fact of asking for the latter would be useful in making the little ones remember to bring them. Then would follow a conversation on birds, their nests, food, eggs, &c. In this agreeable and interesting way several lessons would be given, the teacher remembering that the lessons are suggested by the song, which should be often repeated.

Many other songs will readily be thought of by interested teachers. Any teacher imbued with the proper teaching spirit, and thinking of her little ones, will find great pleasure in adapting songs to suit their lessons, or rather, one should say, will be able to draw useful lessons from the songs.

There are several songs published which could be used to illustrate the movement of the pendulum (Lesson 4), &c. The colour lessons also would be more attractive if songs were used.

(To be continued.)

Tests in Mental Arithmetic.

STANDARD I.

1. In a subtraction sum 40 was the top line, and 7 was the answer; what number was taken away? 33.
2. How many must you add to 29 to make 33? 4.
3. If 4 is put down 5 times, and added together, what is the sum? 20.
4. How many more fours are wanted to make 36? 4.
5. How many halfpenny oranges could you get for 10½d.? 21.
6. How many threes are there in 21? 7.
7. If a boy saved 6d. weekly, how long would it take him to save a crown? 10 weeks.
8. If he spend 1½d. a week, how much would he spend in that time? 1s. 3d.
9. How many seconds are there in half minute? 30.
10. If 30 pencils are divided among 6 boys, how many would each get? 5.
11. What would 30 pencils cost at 20 a penny? 1½d.
12. What would 30 farthing tops cost? 7½d.

STANDARD II.

1. How many miles could I go for 6s. 9d. at a penny a mile? 81.
2. How much more would it cost to go 100 miles? 1s. 7d.
3. How long will it take to save half-a-crown, if you save 3d. weekly? 10 weeks.
4. If you save 10d. a week, how much would you have in that time? 8s. 4d.
5. How many more weeks must you save to have half-a-sovereign? 2.
6. What number multiplied by itself gives 64? 8.
7. How many more than 5 dozen is 64? 4.
8. If eggs are 20 for a shilling, how much would 70 cost? 3s. 6d.
9. How many could I get for 9d.? 15.
10. How many ounces are there in 2 lbs.? 32.
11. What would 2 lbs. of tea cost at 2d. an ounce? 5s. 4d.
12. How many pints are there in 13 quarts? 26.

STANDARD III.

1. What is the half of a thousand? 500.
2. What is a quarter of 500? 125.
3. How much more than half-a-sovereign is 125d.? 5d.
4. How many lbs. of soap at 5d. per lb. could you get for 3s. 9d.? 9.
5. How many more lbs. could you get for a crown? 3.
6. How many farthings are there in a crown? 240.
7. How many score are equal to that number? 12.
8. If a boy speaks 12 words a minute, how many will he speak in half-an-hour? 360.
9. If a clock gain 3 minutes a day, how much will it gain in a fortnight? 42 minutes.
10. How much longer will it take to gain an hour? 6 days.
11. If 2 ounces of pepper cost 2½d., what will ½ lb. cost? 10d.
12. How much could you get for half-a-crown? 1½ lbs.

STANDARD IV.

1. In the number 2,343, what is the difference in the values of the threes? 297.
2. How many threepences are equal to 60 fourpences? 80.

3. How many half-yards are there in a mile?
3,520.

4. What part of 100 is a score? $\frac{1}{5}$.

5. What part of a score is 5? $\frac{1}{4}$.

6. What part of 10s. is 1s. 8d.? $\frac{1}{6}$.

7. What part of 2 cwt. is a stone? $\frac{1}{16}$.

8. How many chairs at 6s. 8d. each could you get for £3? 9.

9. How many half-crown caps could you get for £4 10s.? 36.

10. What is the cost of 80 articles at 1s. 3d. each?
£5.

11. What must you add to that to make 6 guineas?
£1 6s.

12. What is the eighth part of that amount?
3s. 3d.

STANDARD V.

1. How much are 100,000 threepences?
£1,250.

2. Multiply $7\frac{2}{6}$ by 9. 68.

3. What part of £1 is 8d.? $\frac{1}{30}$.

4. What part of 100 is 4 score? $\frac{4}{5}$.

5. What part of 1,000 is 450? $\frac{9}{20}$.

6. Find the difference between $\frac{4}{5}$ and $\frac{9}{20}$. $\frac{7}{20}$.

7. Find the sum of the two fractions. $1\frac{1}{4}$.

8. What is the cost of 39 oranges at 13 for 9d.?
2s. 3d.

9. If 16 men mow a field in 6 hours, how long would 48 men take to mow a similar field?
2 hours.

10. A tree 60 feet high throws a shadow 5 feet long how long would the shadow of a stick, a yard long, be at the same time? 3 inches.

11. Find the amount of £160 in 5 years at 4 per cent. £192.

12. How long would it take to amount to £320?
25 years.

STANDARDS VI. AND VII.

1. What decimal of £1 is 8d.? ·03.

2. What decimal of 8d. is 1d.? ·125.

3. Express decimally the difference between the numbers represented by the 1 and 5. ·095.

4. Express this as a vulgar fraction. $\frac{19}{200}$.

5. A bankrupt pays 6s. 8d. in the £; how much is lost on a debt of £450? £300.

6. One man earns £30, another £50, and another £70. What are the average earnings? £50.

7. What is the interest on £96 for three months at 10 per cent.? £2 8s.

8. What sum will amount to £324 in two years at 4 per cent.? £300.

9. What per centage is ·375 of 1?
$37\frac{1}{2}$ per cent.

10. If I buy an article for £15, and sell it for £12, what do I lose per cent.? 20 per cent.

11. How much must I get for it to gain 25 per cent.? £18 15s.

12. By selling butter at 1s. 6d. a lb. 10 per cent. is lost; what was the prime cost per lb.? 1s. 8d.

Iphigenia in Aulide.

ACT III.

SCENE I.—AGAMEMNON, CLYTEMNESTRA.

Clytemnestra. Yes, my lord, we were departing; and my just anger was soon leaving Achilles and the camp far behind us: my daughter was hastening to hide her shame in Argos, when he himself, astonished at so sudden a flight, has, by many oaths, which I could not doubt, convinced me and detained us. He urges that marriage which it is pretended he defers, and seeks you, burning with love and anger: ready to impose silence to those deceitful rumours, Achilles wishes to know and confound the author of them. Drive away those suspicions which marred our joy.

Agamemnon. Madam, it is enough: I am willing that he should be believed. I see the error that had seduced us, and I participate in your joy as much as I am able. You wish that Calchas should unite him to our family; you can send your daughter to the altar; I await her. But, before going any further, I wished to speak to you alone. You see in what place you have brought her: everything here speaks of war and not of love. The tumult of a camp, soldiers and seamen, an altar crowned with darts, with javelins, that whole sight in fact, pomp which is worthy of Achilles, is not quiet enough to attract your eyes; and the Greeks would see the wife of their king in a state unworthy either of you or me. Believe me, let Iphigenia, followed by your women, go to this marriage without you.

Clytemnestra. Who? I? you would wish that I should put my daughter into other hands and not finish what I have begun; that after having brought her from Argos into Aulide, I should refuse to lead her to the altar! Am I then to be further from Calchas than you? And who will present my daughter to her husband? Who else will order that sacred pomp?

Agamemnon. You are not here in the palace of Atreus. You are in a camp. . . .

Clytemnestra. Where all is subject to you; where the fate of Asia is put into your hands; where I see the whole of Greece under your command; where the son of Thetis will call me his mother. In what magnificent palace, so full of my greatness, can I ever appear in greater splendour?

Agamemnon. Madam, in the name of the gods, of whom we are descended, deign to grant this favour to my love. I have my own reasons.

Clytemnestra. My lord, in the name of the same gods, do not deprive my eyes of so sweet a sight. Deign not to be here ashamed of my presence.

Agamemnon. I had expected that you would be more obliging. But as reason cannot move you, as, in short, my entreaties have so little power, you have heard what I demand of you, madam: I wish it, and I command it you. Obey.

SCENE II.

Clytemnestra. How is it that with such cruel care unjust Agamemnon keeps me away from the altar? Is he so proud of his new position that he should dare to slight me? Does he think me unworthy of appearing at his side; or, as yet too timid a possessor of the empire, would he not dare to show here Helen's

sister? But why should I hide myself? Through what injustice should her disgrace be reflected on my orow? But it is no matter, he wishes it, and my heart submits. My daughter, thy happiness comforts me of all my troubles! Heaven gives thee Achilles; and my joy is extreme when I hear thee named. . . . But here he is himself.

SCENE III.—ACHILLES, CLYTEMNESTRA.

Achilles. Madam, everything favours my wishes; the king would hear no other explanations; he believes in my transports, and, without hardly listening to me, has embraced me and accepted me as his son-in-law. He has said but one word to me. But has he told you what happiness you have brought in the camp? The gods are ready to be appeased. At least, Calchas announces that in an hour he reconciles us with them, that Neptune and the winds, ready to hear our prayers, only wait for the blood which his hand is about to shed. The sails are already set; and, trusting to his promise, the ships already turn towards Troy. As to me, although Heaven should, to gratify my love, delay still longer the return of the winds; although I leave with regret the happy shore, where I am about to kindle the torch of Hymen, have I not reason to be glad of the happy opportunity which I have of confirming our union with the Trojan blood, and to be able to leave soon, under buried Troy, the dishonour of a name to which my own is joined.

SCENE IV.—ACHILLES, CLYTEMNESTRA, IPHIGENIA, ERIPHYLE, ÆGINE, DORIS.

Achilles. Princess, my happiness lies wholly with you; your father at the altar designs you a husband: come and receive there a heart that adores you.

Iphigenia. My lord, it is not yet time that we should start; the queen will allow me to venture to ask of your love a token which it should grant me. I come to present you a young princess. Heaven has impressed her noble descent on her brow. Every day her eyes are bathed in tears; you know her troubles, for you have caused them. Myself, awhile ago (how far my blind passion was carrying me!), I have, without regard, afflicted her in her misery. Oh! that I were able, by useful aid, to repair as readily my unjust words! I plead in her favour; it is the utmost I can do. You alone, my lord, are able to undo your work; she is your captive, and her chains, for which I pity her, when you give the order will fall from her hands. Commence in that way this happy day, that she may not be condemned to see us. Show that the one, whom I am about to follow to the altar, is a king who, not content with terrifying the mortals, does not confine his glory to destruction, but allows the tears of a wife to move him in his victory, and sometimes disarmed by the unhappy, knows how to imitate in all things the gods who have created him.

Eriphyle. Yes, my lord, pray alleviate the greatest of my troubles. The war in Lesbos made me your prisoner, but it is carrying too far its cruel rights to add to it the torments I am suffering here.

Achilles. You, madam?

Eriphyle. Yes, my lord, and, leaving the rest aside, could you impose upon me more cruel a law than to make my eyes the sad witnesses of the happiness of my persecutors? On all sides I see my country threatened; I see a furious army marching against it; already I see Hymen, the better to tear my heart, putting in your hand the fire which is to consume it. Suffer that, away from the camp and out of your presence, ever unfortunate and ever unknown, I may go to hide a fate which is so deserving of pity, and half of which my tears still keep from you.

Achilles. This is too much, fair princess; you have but to follow us. Come, that Achilles may deliver you before the Greeks, and that the sweet time of my felicity may be the happy time of your liberty.

SCENE V.—ACHILLES, CLYTEMNESTRA, IPHIGENIA, ERIPHYLE, ARCAS, ÆGINE, DORIS.

Arcas. Madam, everything is ready for the ceremony. The king at the altar awaits Iphigenia; I have come to ask for her; or rather against him, my lord. I have come to implore your help in her favour.

Achilles. Arcas, what are you saying?

Clytemnestra. O gods! what does he come to tell me?

Arcas to Achilles. I see now none but you able to defend her.

Achilles. Against whom?

Arcas. It is with regret that I name and accuse him: I have kept his secret as long as I have been able; but sword, bandage, and fire are ready. Should all this fall upon my own head, I must speak.

Clytemnestra. I tremble. Speak, Arcas.

Achilles. Whoever it be, speak, and do not fear him.

Arcas. You are her lover; and you her mother: be sure not to send the princess to her father.

Clytemnestra. Why should we fear him?

Achilles. Why should I mistrust him?

Arcas. He awaits her at the altar to sacrifice her.

Achilles. He?

Clytemnestra. His daughter?

Iphigenia. My father?

Eriphyle. O heaven! what news!

Achilles. What blind fury could arm him against her? Can such a speech be heard without horror?

Arcas. Ah, my lord, would to heaven that I might doubt it. But by the voice of Calchas the oracle demands her; he refuses the offering of any other victim; and the gods, who till now have been the protectors of Paris, promise us Troy and the winds but at that price.

Clytemnestra. The gods would order an abominable murder!

Iphigenia. O heaven! of what am I guilty, that I should be treated so severely?

Clytemnestra. I do not wonder now at that cruel order which had forbidden me to approach the altar.

Iphigenia to Achilles. And this, then, is the marriage to which I was destined!

Arcas. The king feigned this marriage in order to deceive you; the whole camp even is deceived as well as you.

Clytemnestra. My lord, it is mine, then, to kiss your feet.

Achilles (raising her). Ah, madam!

Clytemnestra. Forget a useless glory: this sad humiliation becomes my condition. Happy am I if my tears can move you. A mother can fall at your feet without blushing. Alas! it is your wife who is taken away from you; it was in that happy hope I had brought her up; it is you whom we were seeking on

this fatal shore, and it is through the use of your name, my lord, that she is led to death. Will she go to implore the justice of the gods and embrace their altars, adorned for her death? She has no one but you: you are here her father, her husband, her refuge, her gods. By your looks I can see how violent is the pain which you feel. My daughter, I leave you near your husband. Pray await me, lord, and do not leave her. I hasten to present myself to my perfidious husband: he will be unable to endure the fury which animates me. Calchas will have to find another victim; or, if I cannot get you to avoid their blows, my daughter, they will have to sacrifice me before you.

SCENE VI.—ACHILLES, IPHIGENIA.

Achilles. Madam, I remain speechless and still. Is it I who am spoken to, and is Achilles known? A mother thinks she should pray to me in your favour! A queen humiliates herself at my feet! And, dishonouring me by unjust fears, has recourse to tears to soften my heart! Who can be more concerned for your life than I? Ah! no doubt my faith can be relied upon. The outrage concerns me; and, whatever is attempted, I make myself responsible for a life to which I bind my own. But my just grief will further engage me; to defend you is little, and I hasten to avenge you and punish at the same time the cruel stratagem which dares to use my name as a weapon against you.

Iphigenia. Ah! stay, my lord, and pray listen to me.

Achilles. What, madam! a traitor would dare to insult me! He sees that I am ready to go and avenge his sister's outrage; he knows that the first giving him my voice, I caused him to be named chief of twenty kings—his rivals; and as a reward for my troubles, as reward for my labour, as the only prize, in fact, for an illustrious victory, which is to enrich him, to avenge him, and load him with glory, pleased and proud of the name of your husband, I only asked him for the honour of being yours; yet to-day, sanguinary, perjured, not satisfied with violating love and nature, not satisfied with wishing to show me your heart on an altar and smoking under the mortal dagger—concealing this sacrifice under the preparations of nuptials—he wants me to be the one to lead you to death, that my credulous hand should hold the sword, that instead of your husband, I should be your executioner! And what would have been to you this sanguinary marriage if I had arrived a day later? What then? at this moment delivered into their fury, you would go and in vain seek me at the altar, and fall, struck with an unexpected dagger, accusing my name, which would have deceived you? For this peril, and for this treachery, I must, before all the Greeks, ask him satisfaction. Madam, you who are concerned, for the honour of a husband, you no doubt approve of my intention. The cruel, who has so despised me, must learn whose name it is which he has dared to mis-use.

Iphigenia. Alas! if you love me, if as a last favour, you will deign to hear a love's last entreaty, it is now, my lord, that you must prove it to me; for after all, that cruel one whom you are going to brave, that barbarous, unjust, and cruel enemy, think, whatever he may have done, think—he is my father.

Achilles. He, your father? After this horrible design, I only look upon him as your murderer.

Iphigenia. It is my father, my lord, I tell you again; it is a father whom I love, a father whom I adore, who himself cherishes me, and from whom, to this day, I have never received but tokens of love. My heart, which, since my childhood, has been taught to thus respect him, can but feel grieved at anything that offends him, and far from daring, by a sudden change, to approve of the fury of your passion—far from adding to it by my words, believe that I must love as much as I loved you to have suffered all the odious names with which your love has just outraged him in my eyes. And why will you suppose that, inhumane and barbarous, he does not grieve for the blow that is prepared me? Which father takes pleasure in being robbed of his blood? Why would he lose me if he could save me? Do not doubt it, I have seen him shed tears. Is he to be condemned before being heard? Alas! when already troubled with so many horrors, must his heart be also overwhelmed with your hatred?

Achilles. What, madam! when you have so many reasons for fear, those are the terrors with which you are troubled! A cruel (by what other name can I call him) by the hand of Calchas is ready to sacrifice you, and when I oppose my tenderness to his fury, the only care troubling you is that of his tranquility? I am silenced! He is excused! He is pitied! She trembles for his sake, and it is I whom she fears! Sad result of my care! Is this, then, madam, all the progress Achilles had made on your soul?

Iphigenia. Ah, cruel! have I waited till now to prove you that love which you want to doubt? You see with what eye and what indifference I received the cruel news of his death—I did not turn pale at it. Oh, would that you had seen how great a while ago was my despair, when, almost as soon as I had arrived, an untrue report gave me the news of your inconstancy. What trouble, what torrent of injurious words accused at the same time both men and gods! Ah! you would have seen then, and I would have no need to tell you how much dearer to me is your love than my own life! Who knows even, who can tell if Heaven, in its anger, have been able to bear the excess of my felicity? Alas! it seemed to me that so splendid a flame was raising me above the fate of a mortal.

Achilles. Ah! if I be dear to you, my princess, live.

(To be continued.)

—o—

Quarterly Arithmetical Tests.

STANDARD I.—FIRST QUARTER.

1. 46	2. 508		
370	203	4.	8 × 3;
5			4 × 10;
18	3. 976		7 × 2.
492	435		

SECOND QUARTER.

1. 7	2. 614		
59	508	4.	12 × 4;
603			3 × 3;
24	3. 409		11 × 5.
8	324		

THIRD QUARTER.

1. 329
64
451
87
506

2. Take 7 from 500.

3. 702
305

4. 5×8;
9×6;
4×7.

STANDARD II.—FIRST QUARTER.

1. 58 + 4,093 + 6 + 705 + 28,310 + 9,007.
2. From 70,060 take 69,073.
3. Multiply 65,078 by 92.
4. A flock of nine hundred sheep were sent to market, and six hundred and ninety-four were sold. How many remained?

SECOND QUARTER.

1. Find the product of 187 and 654.
2. Divide 42,540 by 6, and write the answer in words.
3. Take 2,012 from 30,400.
4. There are 24 hours in a day; how many hours are there in 739 days?

THIRD QUARTER.

1. From 11,011 take 514.
2. How often is a dozen contained in 54,804?
3. What is 780 times 49,056?
4. There are 87,057 persons in nine towns. How many are there in each town?

STANDARD III.—FIRST QUARTER.

1. Divide 251,748 by 37.
2. 87,096 × 5,080.
3. What is the four hundred and sixth part of 239,540?
4. There were a dozen bags, each containing 208 nuts, and these were divided among 36 boys and 28 girls. How many did each child get?

SECOND QUARTER.

1. Find the sum of £57 9s. 8d., £304 12s. 5½d., £80 16s. 10¼d., £9 7s. 11d., £612 13s. 9¾d., and £73 18s. 4¼d.
2. At an examination 27 boys had four sums right, 39 boys had three right, 46 boys had two right, and 18 boys had one right. How many sums altogether were correct?
3. Take £619 14s. 7¼d. from £704 9s. 5¾d.
4. A horse, cart, and harness cost £49 15s. The horse cost £26 10s., and the cart cost £18 15s. How much did the harness cost?

THIRD QUARTER.

1. What number divided by 567 will give 789 as quotient and 137 as remainder?
2. William has £3 8s. 5d., and Thomas has twice as much. How much have they together?
3. Find the difference between twenty-three thousand and seventy-eight pounds seventeen shillings and ninepence three farthings and thirty thousand one hundred and six pounds thirteen shillings and six pence farthing.
4. What change would I get out of a sovereign after paying for 70 buns at a penny each and 40 at 2d. each?

STANDARD IV.—FIRST QUARTER.

1. Multiply 15s. 0¾d. by 167.
2. What is the cost of a calf weighing 175 pounds at 8½d. per pound?
3. £48,425 4s. 4½d. ÷ 685.
4. How much is 903 times £6,047 11s. 5¼d.?

SECOND QUARTER.

1. Find how many ounces there are in 7 tons 17 lbs.
2. How many guineas are equal to 371,952 halfpence?
3. A man walked 3 miles 7 furlongs. How many yards had he gone?
4. A ton of tea was made into two pound packets, and sold at 5s. per packet. How much was received for it?

THIRD QUARTER.

1. A boy's weekly wages are 4s. 9d.; how long will it take him to earn £12 7s.?
2. A family uses 80 gallons of water daily. How many quarts would they use during the months of May, June, and July?
3. What is the amount of 75 half-sovereigns, 69 half-crowns, and 158 half-pence?
4. What is the cost of a square yard of land at £332 15s. per acre?

STANDARD V.—FIRST QUARTER.

1. What is the value of 6,759 articles at £7 18s. 1¼d. each?
2. Find the cost of 76 bus. 2 pks. 3 qts. at 23s. 4d. per bushel.
3. Find the value of 11,820 bottles of wine at 49s. 8d. per dozen.
4. What is the amount of wages for 11 months (of 4 weeks each) 3 weeks 3 days at 22s. 9d. per week?

SECOND QUARTER.

1. If 21 men can build a house in 45 days, how many men could build it in 27 days?
2. Find the cost of constructing a telegraph for a distance of 86 mls. 2 fur. 25 po. at £475 12s. per league.
3. If 40 yards of material, $1\frac{3}{4}$ yards wide, can be bought for £37 15s., how many yards of the same material, $1\frac{1}{4}$ yards wide, can be bought tor the same money?
4. Bill:—
9 dozen bottles port at 39s. 6d. per doz.;
$7\frac{1}{2}$ „ „ sherry at 45s. per doz.;
3 „ „ champagne at 87s. 9d. per doz.
19 bottles brandy at 78s. per doz.;
15 „ whisky at 42s. 6d. per doz.

THIRD QUARTER.

1. Simplify:—$(\frac{1}{2} + \frac{1}{4} + \frac{1}{10}) - (\frac{1}{5} + \frac{1}{4})$.
2. Find the sum of $\frac{5}{6}$ of a sovereign and $\frac{5}{6}$ of a shilling.
3. What will be charged for flooring a room 25 ft. 6 in. long and 18 ft. wide at 2½d. per sq. ft.?
4. Express the following fractions with 36 for their denominators:—$\frac{4}{9}$, $\frac{15}{20}$, $\frac{5}{6}$, $\frac{20}{48}$, and $\frac{2}{3}$.

STANDARD VI.—FIRST QUARTER.

1. Simplify $(8{\cdot}607 - 5{\cdot}0738) \times {\cdot}0905$.

2. The divisor is $7\frac{3}{8}$, and the quotient is $6\frac{5}{9}$; find the dividend.

3. Express the difference between $\cdot\dot{3}\dot{0}\dot{7}$ and $\cdot\dot{3}0\dot{7}$ as a vulgar fraction.

4. Simplify :— $\dfrac{\frac{1}{8} - (\frac{1}{7} - \frac{1}{9})}{\frac{1}{4} - \frac{1}{21}}$.

SECOND QUARTER.

1. Subtract ·005 of a pound from ·0075 of a guinea, and express the difference as the fraction of a penny.

2. If I work $2\frac{1}{2}$ days for $£1\frac{5}{16}$, how long should I work for $£4\frac{1}{2}$?

3. A man left $\frac{1}{3}$ of his property to his son, $\frac{1}{5}$ to his daughter, and the remainder, which was £4,060, to his wife. What was the value of the whole property?

4. If £156 16s. 8d. be lent for three months, how long ought £117 12s. 6d. to be lent in return?

THIRD QUARTER.

1. What is the greatest number that will divide 3,460 and 6,277, leaving remainders of 4 and 5, respectively?

2. What will £696 13s. 4d. amount to in $4\frac{1}{2}$ years at $3\frac{3}{4}$ per cent.?

3. Represent 17 tons 17 cwt. 3 qrs. 21 lbs. in tons.

4. What sum will gain £61 19s. in 3 years at $3\frac{1}{2}$ per cent.?

STANDARD VII.—FIRST QUARTER.

1. If 3 men earn £3 12s. in 6 days, working 8 hours a day, in how many days would they earn £4 10s., working 9 hours a day?

2. What decimal multiplied by $\frac{11}{31}$ will be equal to $\frac{3}{7} + \frac{7}{8} - \frac{8}{9}$?

3. A garrison of 4,000 men has provisions for 66 days at 25 oz. each man per day; how much ought each man to receive daily, that the provisions may last 80 days, after the garrison is reinforced by 1,500 men?

4. Divide £4 9s. $4\frac{1}{2}$d. among A, B, and C, giving A three times as much as B, and B three times as much as C. What is C's share?

SECOND QUARTER.

1. Ten men are engaged at the following wages:— Two have 38s. 6d. each per week: three have 37s. 9d. each; four have 36s. 3d. each; and one has 28s. 6d. Find the average weekly wages.

2. At what rate per cent. will the interest on £574 7s. 6d. amount to £86 3s. $1\frac{1}{2}$d. in 5 years?

3. The attendances at five schools are 350, 460, 270, 585, and 392; what must be the attendance at a sixth school to make the average for the six schools 418?

4. What will be the remainder when 14·806 has been subtracted as many times as possible from 975?

THIRD QUARTER.

1. John is 12 years old, and his age is 30 per cent. of his father's; how old is his father?

2. In what time will the interest on £435 16s. 8d. amount to £72 9s. $1\frac{3}{4}$d. at $3\frac{1}{2}$ per cent.?

3. The value of a ship's cargo is 70 per cent. of the value of the ship, and the ship and cargo are together worth £13,600; what is the value of the cargo?

4. By selling cloth at 8s. 9d. a yard a shopkeeper loses 9 per cent.; at what price per yard must he sell it to gain 17 per cent.?

ANSWERS.

STANDARD I.

	FIRST.	SECOND.	THIRD.
1.	931.	701.	1,437.
2.	305.	106.	493.
3.	541.	85.	397.
4.	24; 40; 14.	48; 9; 55.	40; 54; 28.

STANDARD II.

	FIRST.	SECOND.	THIRD.
1.	42,179.	122,298.	10,497.
2.	987.	7,090.	4,567 times.
3.	5,987,176.	28,388.	38,263,680.
4.	206 sheep.	17,736 hours.	9,673 persons.

STANDARD III.

	FIRST.	SECOND.	THIRD.
1.	6,804.	£1,138 19s. $0\frac{3}{4}$d.	447,500.
2.	442,447,680.	335 sums.	£10 5s. 3d.
3.	590.	£84 14s. $10\frac{1}{2}$d.	£7,027 15s. $8\frac{1}{2}$d.
4.	39 nuts.	£4 10s.	7s. 6d.

STANDARD IV.

	FIRST.	SECOND.
1.	£125 15s. $5\frac{1}{4}$d.	251,152 oz.
2.	£6 3s. $11\frac{1}{2}$d.	738 guineas.
3.	£70 13s. $10\frac{1}{2}$d.	6,820 yards.
4.	£5,460,957 8s. $0\frac{3}{4}$d.	£280.

	THIRD.	
1.	1 year.	3. £46 9s. 1d.
2.	29,440 quarts.	4. 1s. $4\frac{1}{2}$d.

STANDARD V.—FIRST.

1.	£53,431 6s. $0\frac{3}{4}$d.	3.	£2,446 1s. 8d.
2.	£89 7s. $2\frac{1}{4}$d.	4.	£53 19s.

	SECOND.
1.	35 men.
2.	£13,685 17s. $8\frac{1}{2}$d.
3.	56 yards.
4.	£17 15s. 6d. + £16 17s. 6d. + £13 3s. 3d. + £6 3s. 6d. + £2 13s. $1\frac{1}{2}$d. = £56 12s. $10\frac{1}{2}$d.

	THIRD.	
1.	$\frac{1}{3}$.	3. £4 15s. $7\frac{1}{2}$d.
2.	17s. 6d.	4. $\frac{15}{16}$, $\frac{23}{32}$, $\frac{29}{32}$, $\frac{11}{32}$, $\frac{24}{32}$.

STANDARD VI.

	FIRST.	SECOND.	THIRD.
1.	·3197546.	$\frac{69}{100}$d.	128.
2.	$48\frac{1}{13}$.	12 days.	£814 4s. 7d.
3.	$\frac{11}{5\,3\,0\,3\,2}$.	£8,700.	17·896875 tons.
4.	$\frac{47}{101}$.	4 months.	£590.

STANDARD VII.

	FIRST.	SECOND.	THIRD.
1.	$6\frac{2}{3}$ days.	£1 16s. $4\frac{1}{2}$d.	40 years.
2.	·7916.	3 per cent.	$4\frac{1}{2}$ years.
3.	15 oz.	451.	£5,600.
4.	6s. $10\frac{1}{2}$d.	12·61.	11s. 3d.

THE MENAGERIE.

1st TREBLE.
2nd TREBLE.
BASS.

1. Cu - rious beasts are here for show, Of all sorts and a - ges— Howl - ing, growl - ing,
2. Here are mon - keys full of fun— Jump - ing, grin - ning, whi - ning; And the time to
3. List - en, all, and learn their names; We will now re - peat them, That we all may

KEY G.

1st TREBLE.
2nd TREBLE.
BASS.

sharp and fierce, Safe in ir - on ca - ges: Li - ons, ti - gers, leop - ards, bears,
see them best Is when they are di - ning. When the li - on smells the meat,
know them well When we chance to meet them: There's the sloth and tall e - mu,

D.t.

f

Lynx - es, el - e - phants, and deers, Rab - bits, too, and tim - id hares—Brought by ea - sy sta - ges.
How he roars at such a treat! You would think he means to eat Man, and hat and li - ning!
There's the jump - ing kan - ga - roo—With their tails they make a stew, And the black - ies eat them.

f

CHORUS. *mf* *ff*

1. Hark! the ti - gers now do growl! *Oo! oo! oo! ow! ow! ow!
2 & 3. Hark! the li - ons now do roar! Oo! oo! oo! ow! ow! ow!

f. G. CHORUS. *mf* *ff*

mf *ff* *Symph.*

Round a - bout the cage they prowl; Oo! oo! oo! ow! ow! ow!
Food they've had, but want some more; Oo! oo! oo! ow! ow! ow!

mf *ff* *Symph.*

* Sing in a rough, growling style.

Shakspere's 'Macbeth.'

BY J. L. KINTON, B.A.,

Late Lecturer on English Literature at the Westminster Training College.

V.

ACT I.—*Continued.*

SCENE IV. THE PALACE AT FORRES.

Enter DUNCAN, MALCOLM, DONALBAIN, LENOX, *and Attendants.*

Dun.—Is execution done on Cawdor? Are not
Those in commission yet returned?
Malc.— My liege,
They have not yet come back, But I have spoke
With one that saw him die: who did report
That very frankly he confess'd his treasons,
Implor'd your highness' pardon, and set forth
A deep repentance: nothing in his life
Became him like the leaving it: he died
As one that had been studied in his death
To throw away the dearest thing he owed
As 'twere a careless trifle.
Dun.— There's no art
To find the mind's construction in the face.
He was a gentleman on whom I built
An absolute trust.

Enter MACBETH, BANQUO, ROSSE, *and* ANGUS.

O worthiest cousin!
The sin of my ingratitude even now
Was heavy on me. Thou art so far before,
That swiftest wing of recompense is slow
To overtake thee. Would thou hadst less deserved,
That the proportion both of thanks and payment
Might have been mine! Only I have left to say,
More is thy due than more than all can pay.
Mach.—The service and the loyalty I owe,
In doing it, pay itself. Your highness' part
Is to receive our duties; and our duties
Are to your throne and state, children and servants,
Which do but what they should by doing everything
Safe toward your love and honour.
Dun.— Welcome hither:
I have begun to plant thee, and will labour
To make thee full of growing. Noble Banquo,
Thou hast no less deserv'd nor must be known
No less to have done so. Let me infold thee
And hold thee to my heart.
Ban.— There if I grow
The harvest is your own.
Dun.— My plenteous joys,
Wanton in fulness, seek to hide themselves
In drops of sorrow. Sons, kinsmen, thanes,
And you whose places are the nearest, know
We will establish our estate upon
Our eldest, Malcolm, whom we name hereafter
The Prince of Cumberland; which honour must
Not unaccompanied invest him only,
But signs of nobleness, like stars, shall shine
On all deservers. From hence to Inverness,
And bind us further to you.
Mach.—The rest is labour, which is not used for you.
I'll be myself the harbinger, and make joyful
The hearing of my wife with your approach;
So humbly take my leave.
Dun.— My worthy Cawdor!
Mach. [*aside*].—The Prince of Cumberland! That is a step
On which I must fall down, or else o'erleap,
For in my way it lies. Stars! hide your fires;
Let not light see my black desires;
The eye wink at the hand; yet let that be
Which the eye fears, when it is done, to see. [*Exit.*
Dun.—True, worthy Banquo; he is full so valiant,
And in his commendations I am fed;
It is a banquet to me. Let's after him,
Whose care is gone before to bid us welcome.
It is a peerless kinsman. [*Flourish. Exeunt.*

In this scene a powerful dramatic contrast is drawn between the generous confidence of the king, and the villainy meditated by Macbeth. The king's reflections on the late Thane of Cawdor still further heighten the effect.

NOTES.

1.—*Execution* is literally, a *following* or carrying out of the sentence of the law (L. *Sequor, secutus*). We should now speak of the *criminal* being executed.

2.—*Those in commission*, to whom it is committed. This is a legal term. *Are . . . . returned.* A verb of motion conjugated with the auxiliary *to be* (pft. tense Act.), like 'are come.'

3.—*My Liege*, in full 'my liege lord,' my sovereign. The word is also used of the subject, 'a liege vassal,' as though derived from L. *ligatus*, bound. But the word is of Germanic origin, through the French (*lidig, liege*, free). See Skeat, Etym. Dict.

4.—*Frankly*, freely, fully. Another O. F. word from the Old German.

5.—*Highness*. Formerly the title of English sovereigns; now used of princes of the blood royal. The Latin word 'Majesty' began to take its place under the Tudors. *Set forth*, manifested, expressed.

7.—*The leaving it.* This mixed form shows how the verbal noun became a gerund, *i.e.*, 'the leaving of it,' became 'leaving it,' without article or preposition.

9.—*As one that had been studied in his death*, like a man that has been well practiced in preparing to play the part of his death, of dying. The verb is not passive. '*Studied*' is a participle adjective: *cf.* 'He is well read,' (See Abbott, Sh. Gr. 295.)

10.—*Owed*, possessed. (Act i.3, l. 76) *Dearest*, most valuable.

11.—*As*, as if. *Careless*, unvalued, regarded as worthless.

11. 12.—*No art to find*, etc., no art of finding, by which to find the *mind's construction*, the character.

14.—*An absolute trust*, unlimited confidence.

14-20.—Duncan uses hyperbolical language to express his deep sense of Macbeth's merits and his own obligation to him

15.—*My ingratitude*, my imperfect return for your services.

16-18.—*Thou art so far before*, your deserts far surpass my most earnest desires and attempts to reward you.

18.—*Would thou hadst less deserved.* I could even have wished that your deserts had been less. *Would*, for *I would.*

19-20.—*That the proportion*, etc., that I might have been able make a suitable recompense both in words and deeds.

20-21.—The construction is: 'I have only (this) left to say (that) thy due is more [greater] than all (that I possess) can pay.

22.—*I owe;* here this word is used in the present sense. (see l. 10.) *Service* and *loyalty . . . . pays;* like '*Time* and the *hour* runs' (sc. 3, l. 147). The verbal termination *s* with two nouns, especially when of allied signification as here, is of frequent occurrence in Shakspere. The pronoun also is put in the singular, 'in doing *it*,' *i.e.*, *itself:* 'in doing itself, pays itself'; the mere performance of a loyal service is sufficient reward. The sentiment is the same as 'Virtue is its own reward.'

25.—'Are children and servants to your state and throne.' The 'duties' are personified. *Which*, for *who.*

27.—*Safe.* The phrase would be simpler without this word. But the sense perhaps is, 'By doing everything that will tend to make your love and honour secure,' *i.e.*, by putting down all disaffection and opposition.

28.—*To plant thee*, to honour you: *and I will make thee full of growing*, and I will more fully reward you. But this paraphrase destroys the metaphor. Nouns in *-ing* are very numerous in this play, as *having, soliciting, imaginings, taking-off* (sc. 7, l. 20), etc. In all these instances we should now use an ordinary abstract noun: as *growth*, for *growing.*

30.—*That hast*, who hast. The relative *that* cannot now be used in an attributive sentence which does not define the antecedent substantive, *e.g.*, 'Ice *that* is found in April,' etc., but 'Ice, *which* is frozen water,' etc. (See Abbott, 260). *Nor must be known, No less*, etc. A double negative, which was common in the oldest English, and frequent in Tudor-English, but now vulgar.

31.—*There if I grow*, etc. Banquo continues the metaphor (ll. 8-9).

32—*The harvest is your own*, all the honour and advantages shall be yours.

33.—*Wanton*, unrestrained. This is the original meaning. The O.E. form was *wantowen*, from the participle *towen* (A. S. *togen* from *teon* to draw) and the negative prefix *wan*, (as in *wanhope* = despair.)

34.—*Seek to hide themselves in drops of sorrow*, can only be expressed by tears.

36.—*Nearest* (to the throne); ministers of state.

37-42.—Duncan embraces the opportunity in order to fix the succession, and bestow honours on his courtiers. This brings about a change in Macbeth's position and his relation to the crown. Had the king died during the minority of Malcolm, Macbeth, as next in blood 'of able age' (Holinshed), would have succeeded him; but this arrangement of Duncan's frustrated his hopes of such a succession in a natural way, and he is thus more fully determined on his murderous design.

39.—*Prince of Cumberland.* This title was held by the heir to the Scottish throne. Cumberland, or Cumbria, was formerly a Celtic kingdom, west of Northumbria: but at this time was a feudal state held by Scotland from the English crown.

42.—*Deservers.* Compare 'the *pauser*' (act ii. 3, l. 93). For 'that deserve;' 'that pauses.'

(Go) *to Inverness.* Duncan signifies his intention to visit Macbeth's castle as a mark of royal honour. This furnishes Macbeth with an immediate opportunity to assassinate the king. 'The sight of means to do ill-deeds, makes ill-deeds done.'

43.—*Bind us further to you.* Put me under fresh obligation by your hospitality.

44.—Construe, *The rest which is not used for you is labour:* Leisure, unless occupied in your service is wearisome. This is only another mode of saying that to serve the king is his greatest pleasure.

45.—*Harbinger*, forerunner. Properly one who provided lodging for an army. (M. E. *herbergeour*,) of the same origin as *harbour*. O.F. from the O.G. See Skeat, Et. Dict.

45, 46.—Macbeth wishes to hurry on before the king that he may confer with his wife, to whom he has already written. *Make joyful the hearing*, etc. Make my wife joyful by hearing (the news) of your approach.

48.—*That is a step.* The step by which Malcolm ascends suggests the idea of a stumbling-block.

50-52.—The murder must be done at night, when even the stars would give too much light for so dark a deed, and when I shall not see what I do. *Wink* is here used of the closing of the eyes, the not seeing, as in Acts xvii. 30, 'The times of which ignorance God winked at.'

52-53.—Construe: 'Yet let that be (*done*) which the eye fears to see when it is done.'

Macbeth has thus soliloquised while leaving the royal presence: meanwhile Duncan has been still further engaged with Banquo in praise of his treacherous subject. The king's unsuspecting confidence stands out in strong contrast with Macbeth's hypocrisy.

54.—*Full so valiant*, fully as valiant (as you say).

55.—*In his commendations*, etc., to hear him praise delights me. *It, i.e.*, his being praised.

56.—*A banquet.* This carries the metaphor (involved in '*fed*') further. 'It affords me indeed, the highest pleasure.'

58.—*It* is a peerless kinsman (that we speak of). *Peerless*, without peer (L. *par*, equal).

SCENE V.—*Inverness. A Room in* MACBETH'S *Castle.*

Enter LADY MACBETH, *reading a letter.*

Lady M.—They met me, in the days of success; and I have learned by the perfectest report, they have more in them than mortal knowledge. When I burned in desire to question them farther, they made themselves—air, into which they vanished. Whiles I stood rapt in the wonder of it, came missives from the king, who all-hailed me, Thane of Cawdor; by which title, before, these weird sisters saluted me, and referred me to the coming on of time, with, Hail King that shall be! This have I thought good to deliver thee, my dearest partner of greatness, that thou mightest not lose the dues of rejoicing, by being ignorant of what greatness is promised thee. Lay it to thy heart, and farewell.
Glamis thou art, and Cawdor; and shall be
What thou art promised: Yet do I fear thy nature;
It is too full o' the milk of human kindness,
To catch the nearest way: Thou wouldst be great;
Art not without ambition, but without
The illness should attend it. What thou wouldst highly,
That wouldst thou holily; wouldst not play false,
And yet wouldst wrongly win; thou'dst have, great Glamis,
That which cries, Thus thou must do, if thou have it;
And that which rather thou dost fear to do,
Than wishest should be undone. Hie thee hither,
That I may pour my spirits in thine ear:
And chastise with the valour of my tongue
All that impedes thee from the golden round,
Which fate and metaphysical aid doth seem
To have thee crown'd withal.—

Enter an Attendant.

What is your tidings?

Atten.—The king comes here to-night.

Lady M.—Thou'rt mad to say it:
Is not thy master with him; who, were't so,
Would have inform'd for preparation.

Atten.—So please you, it is true; our thane is coming:
One of my fellows had the speed of him;
Who, almost dead for breath had scarcely more
Than would make up his message.

Lady M.—Give him tending,
He brings great news.—The raven himself is hoarse,

[*Exit Attendant.*

That croaks the fatal entrance of Duncan
Under my battlements. Come, come, you spirits
That tend on mortal thoughts, unsex me here;
And fill me, from the crown to the toe, top-full
Of direst cruelty! make thick my blood,
Stop up the access and passage to remorse,
That no compunctious visitings of nature
Shake my fell purpose, nor keep peace between
The effect and it! Come to my woman's breasts,
And take my milk for gall, you murd'ring ministers,
Wherever in your sightless substances
You wait on nature's mischief! Come, thick night
And pall thee in the dunnest smoke of hell!
That my keen knife see not the wound it makes;
Nor Heaven peep through the blanket of the dark,
To cry, *Hold, hold!*——Great Glamis! worthy Cawdor!

[*Enter* MACBETH.

Greater than both, by the all-hail hereafter!
Thy letters have transported me beyond
This ignorant present, and I feel now
The future in the instant.
Mach.— My dearest love,
Duncan comes here to night.
Lady M.— And when goes hence?
Mach.—To-morrow,—as he purposes.
Lady M.— O, never
Shall sun that morrow see!
Your face, my thane, is as a book, where men
May read strange matters. To beguile the time,
Look like the time: bear welcome in your eye,
Your hand, your tongue: look like the innocent flower,
But be the serpent under it. He that's coming

Must be provided for: and you shall put
This night's great business into my despatch;
Which shall to all our nights and days to come
Give solely sovereign sway and masterdom.
Mach.—We will speak farther.
Lady M.— Only look up clear;
To alter favour ever is to fear:
Leave all the rest to me. [*Exeunt.*

The 'supernatural soliciting' of the weird sisters, the internal 'suggestion' from the spirit of evil, and the combination of external circumstances urging Macbeth on to carry out his dark design, are now powerfully supplemented by the concurrence and assistance of his wife, who 'by the valour of her tongue' skilfully works on the weak points of his character, and allows no faltering or hesitation in the performance of the deed. Macbeth has written to her, and from his words she at once divines his desires and intentions. Only part of his letter is read, but sufficient for the purpose of the drama.

NOTES.

1.—*They*, the weird sisters. *Success*, victory.

2.—*By the perfectest report, i.e.*, by the message from the king, which confirmed their prediction, as he goes on to say. *Perfectest* is virtually a double superlative. In O.E. the terminations of comparison were added to adjectives of every form; as *violentest, mervelllousest* (Abbot, Sh. Gr. 9).

3.—*Mortal*, human, natural.

5.—*Whiles*, for *while* or *whilst*. *Whiles* is the genitive of a noun used adverbially; this is strengthened by the euphonic *-t* in the modern form. Cp. *needs, once* (ones).

6.—*Rapt*, absorbed (sc. 3, l. 27).

7.—*Missives*. Here used of persons, *messengers*. From L. *mitto, missus*, send, throw (whence, missile, messenger), but *missive* is not a true Latin word.

8.—*The coming on of time*, the future.

9.—*Deliver thee*, make known to thee. 'Deliver' is literally to set free (L. *liber*), hence, to utter. We still speak of a good or bad delivery, in reference to speech. The old second pers. pron. sing. is here used in the language of familiar affection.

11.—*The dues of rejoicing*, the joy which is your due (as my wife). *Of what greatness*, etc., of the greatness which. The relative was more freely used in O.E. as *adjective*, than it is at present.

12.—*Lay it to thy heart*, think closely upon it. *Heart* was formerly *used* of the mind, as in 'learn by heart.'

13.—In this soliloquy and the next, Lady Macbeth describes her husband's character and indirectly reveals her own. Shakspere's power of depicting human nature is here strikingly seen, and the language is equal to the ideas.

14.—*Fear*, have no confidence in; cannot rely on.

15.—*The milk of human kindness*. This remarkable metaphor well expresses the mingled idea of tenderness and weakness.

16.—*To catch the nearest way*, to seize upon the most direct method of effecting the purpose (irrespective of moral considerations). More is here meant than meets the ear. These guilty beings shrink from the full statement of their thoughts.
Thou wouldst, art desirous, wishest. This verb was used largely as a principal verb in O.E. It is here subjunctive (conditional) 'Thou wouldst be great (if thou couldst).'

17.—*But* (art) *without*. The elliptical language is suitable to the earnest emotion of the speaker.

18.—*The illness* (that) *should*. The relative when objective is still freely omitted, but in Tudor-English the nominative also is frequently dispensed with, as here: so 'To do always that (which) is righteous in thy sight.' Prayer-Book.
Illness is a mild term for *evil, wickedness*. Now used only of physical sickness.

18, 19.—*What thou wouldst highly, . . . holily*. You desire to succeed, carry out ambitious schemes, by innocent means. 'To will highly' is to desire what is high.

20.—*Wrongly win*, gain that which it is wrong for you to possess.

20-23.—This is a difficult passage. We may construe and explain it as follows:—'Thou wouldst have that [the crown] which cries [*i.e.* requires] (that) if you have it, thou must do thus [must act in a certain manner] and (must do) that which thou rather fearest to do than wishest (that it) should be undone [*i.e.* not done].'
But some prefer to consider 'that which cries' to mean 'Duncan's murder.'

23.—*Hie* thee, haste thee (A.-S. *higian*). The pronoun is reflective.

24.—*My spirits*, my firmness of purpose. 'That I may fix your determination by declaring my own.'

25.—*Chastise . . . all that impedes thee from*, etc., correct all the weakness of your nature that prevents you from gaining, etc. To *chastise* is properly to make pure, purify, correct. *The valour of my tongue*, the courageous determination which my speech will inspire.

26.—*The golden round*, the circlet, or crown of gold. Adjectives indicating the material formerly ended in *-en*. Such words are now generally used in a figurative signification.

27.—*Metaphysical*, preternatural, superhuman. This word is properly a term of philosophy, and refers to what is *immaterial*, whether natural or supernatural. *Metaphysics* is the science of *mind*.

27, 28.—*Which—withal*, with which. Here *withal* is used for *with*, because placed at the end of the sentence (See sc. 3, 27).
Doth seem. Another instance of singular verb with two nominatives allied in meaning.

28.—*To have thee crowned*, to bring (be bringing) about thy coronation. *Have* is here causative (like the French *faire*).
Paraphrase (The golden round, etc.); 'the crown, which destiny and supernatural agency appear to be putting within your reach.'
What is your tidings. Tidings takes the verb in the singular, as expressing a simple idea, being equivalent to *intelligence*. So colloquially, 'What's the *news*?'

29.—*Thou'rt mad to say it*. This is spoken with mingled astonishment, delight, and affected anger. The man has received information of Duncan's approaching visit from one of his fellow-servants, who had outrun Macbeth in his eagerness to bring the news. Lady Macbeth first violently expresses her incredulity as to a visit so opportune for her purpose, and then, as it were, excuses herself, and pretends to explain her meaning, lest her manner should give rise to suspicion in the servant's mind.

30.—*Were't so*, if it were as you say, if the king were coming.

31.—*Inform'd for preparation*, sent information (to me) that I might prepare (for his visit).

32.—(If it) *please you* (that it be) *so*.

33.—*My fellows*, companions. This is the proper meaning of the noun, now generally used familiarly or contemptuously. The adjective has the original sense. 'Fellow servant.'
Had the speed of him, arrived here more quickly than he. Cp. the phrase, 'got the better of him.'

34.—*Dead for breath*, almost dying through loss of breath.
Had scarcely more than would, etc., had barely sufficient breath to utter his message.

35.—*Give him tending*, attend to him. *Tending*, for attention, or attendance, is another of the numerous nouns of this form in 'Macbeth,' already referred to. See also 'coming on' (l. 8) and 'rejoicing' (l. 11).

36.—*The raven himself is hoarse*, etc. The croaking of the raven was supposed to forebode misfortune, and Lady Macbeth connects its cry, which she hears, with the coming of the king, as indicative of his approaching fate.
Come, you spirits, etc. She now gives herself wholly up to her wicked feelings, and calls upon the powers of darkness to strengthen her in her 'fell purpose.'

39.—*Mortal*, deadly, used causatively (cp. l. 3).
Unsex me, take from me all my feminine tenderness.

40.—*Top-full*, full to the top, brimful, entirely. An invented word.

41.—*Make thick my blood.* Thick blood was supposed to be connected with cruelty of disposition.

42.—*Remorse*, pity, compunction. A common meaning of the word in O.E.

43.—*Visitings*, visits. The feelings are personified. *Compunctious visitings; nature*, natural feelings of compassion.

44, 45.—*Keep peace between the effect and it*, prevent my purpose from being carried into effect. *It* is the *purpose*.

46.—Take my *milk for gall*, let my womanly kindness be turned into bitterness and cruelty.
Murdering ministers, spirits that incite to murder.

47.—*Sightless*, properly, without sight, but here *invisible*, not perceptible to sight.

48.—*Wait on nature's mischief*, assist in working mischief throughout nature.

49.—*Pall thee*, robe, cloak thyself. Pall (L. *pallium*), a cloak.

50.—*Dunnest*, darkest, densest. *Dun* is properly dark brown; a Celtic word, though found in A.-S. Shakspere uses these rare terms with great effect. He uses a more varied and extensive vocabulary than any other English writer.

50.—*That my keen knife see not.* She is now so excited that she is ready to commit the murder herself. *See* is subjunctive, which mood was extensively used in Tudor-English. Here it is found in a 'consecutive' sentence (*i.e.*, indicating result). We now use the 'Potential' '*may see.*'

51.—*Blanket*; a word suggested by the idea of the sleeping world covered over with darkness. She desires that even heaven shall not be able to see the deed and attempt to check the performance of it.

52.—As her husband enters, Lady Macbeth at once rushes to the subject with which her soul is filled, and without preface she unfolds to him all her anticipations and intentions.

53.—*The all-hail hereafter*, the promise of royal power in the future.

54.—*Have transported me*, etc., have given me knowledge beyond what could have been learned from the facts of the present time.

56.—*The instant*, the present. From L. *instare*, to stand against, be near, urge, etc. Cp. *instantly*. Used here, apparently, to avoid the repetition of 'present' (l. 55).
My dearest love. The affection displayed by Macbeth towards his wife is in strong contrast with his sanguinary designs against Duncan.

59.—*Morrow* in O.E. signifies both morning and the coming day. It is used in both senses in these lines. *That morrow*, the morrow (morning) of his going hence. She now advises her husband to avoid displaying his feelings in his countenance. It is one of Macbeth's weaknesses that he cannot control those exhibitions of emotion.

61.—*To beguile the time, look like the time:* Deceive those you are with by appearing to be taken up with the events passing around you.

65.—*Provided for*, taken care of.

66.—*Into my dispatch*, into my management, who will effect it without delay. A very concise expression.

68.—*Solely*, entirely, without limitation.

69.—*Clear*, cheerfully.

70.—*Favour.* This word is much used in Shakspere's time in the sense of 'the countenance,' 'the face,' as expressing (among other feelings) *favour* towards any one. Similarly *countenance* is used as a verb. *To alter favour, ever is to fear*, to keep changing the expression of one's face is always indicative of timidity.

(To be continued.)

Pupil Teacher Examination Papers.

(Scotland.)

27TH OCTOBER, 1888.

END OF THIRD YEAR.

SECOND PAPER.—*Continued.*

Teaching.

1. Explain the use of map-drawing in the teaching of Geography? At what stage would you introduce it? *or*,
2. Write notes of a lesson for an infant class on 'Sugar.'

MAP DRAWING.

Without map-drawing the teaching of geography is a mere lifeless cram, and it should be practised as soon as the pupil has made some progress in the subject. There are so many diagrams to illustrate the geographical definitions that the study can easily be made a pleasure. Object lessons on the locality and scenery near the school may serve as an introduction to the subject. A plan of the school will serve as a good specimen of a map. Then, models of islands, capes, bays, &c., may be made on a table with sand, and the outlines of these sketched on the blackboard. These little sketches can be copied by the pupils, and they will be led to gradually see the meaning of a map. All descriptions should precede the exhibition of the map, and only the lesson for the day should be drawn, and that on as large a scale as possible. The drawing of these maps imprints the matter on the minds of the scholars, and the text-book should merely be an auxiliary to supply notes to the towns, &c., shown on the map.

Needlework.

Hem two sides of a piece of print, and set in a patch 2½ inches square.

Latin.

1. Translate:—

(*a.*) Labienus ut erat ei praeceptum a Caesare, ne proelium committeret, nisi ipsius copiae prope hostium castra *visae essent*, ut undique uno tempore in hostes impetus *fieret*, monte occupato nostros expectabat proelique abstinebat. Multo denique die per exploratores Caesar cognovit et montem a suis *teneri* et Helvetios castra movisse et Considium timore perterritum quod non videsset pro viso sibi renuntiasse.

(*b.*) *Hoc* esse miseriorem et graviorem fortunam Sequanorum quam reliquorum, quod soli ne in occulto quidem queri neque auxilium implorare auderent absentisque Ariovisti crudelitatem, velut si coram adesset, horrerent, propterea quod *reliquis* tamen fugae facultas daretur, Sequanis vero, qui intra fines suos Ariovistum recepissent, quorum oppida omnia in potestate eius essent, omnes cruciatus essent perferendi.

TRANSLATION.

(*a*) 'Labienus, as he had been instructed by Cæsar not to join battle unless his own forces were seen near the camp of the enemy, in order that at the same time an attack from every quarter might be made upon the enemy, the mountain having been seized, waited for our men and refrained from battle. At length, much of the day being spent, Cæsar learnt from scouts both that the mountain was held by his own troops, and that the Helvitii had moved their camp; and that Considius, terrified by a panic, had reported to him as seen what he had not seen.'

(*b*) 'That the fortune of the Sequani was more wretched and grievous than that of the rest, because that they alone dared not, even in private, complain nor ask help, and that they shuddered at the cruelty of Ariovistus when absent, just as if he were present, because the means of flight at least were afforded to the rest, but that by the Sequani, who had admitted Ariovistus within their territories, and all whose towns were in his power, all manner of cruelties were to be endured.'

2. Parse and explain the construction of the words in italics.

PARSING.

visae—trans. verb, 2nd conj., *video, -vidi, -visum, -vidēre*, part., pass., nom., pl., fem., agr. with 'copiæ.'
essent—subst. verb, here auxil., *sum, fui, esse*, conditional, imperf., 3rd pers., pl., agr. with subj. 'copiæ.'

faceret—pass. of 'facio,' *fio, factus, fieri*, conditional, imperf., 3rd pers., sing., agr. with 'impetus.'
teneri—trans. verb, 2nd conj., *teneo, -ui, tentum, tenere*, pass., infin., pres.
hoc—demonstr. adj. pron., *hic, haec, hoc*, neut., sing., abl. of 'cause.'
reliquis—adj., 1st and 2nd decl., *reliqui, -a, -a*, seldom *reliquus, -a, -um*, pl., mas., dat., after 'daretur.' This verb governing two cases in the act. voice, retains the latter case in the pass.

3. When does the relative *qui* require the subjunctive mood? Give examples of *qui* with indicative and subjunctive respectively, with translation.

(1) 'Qui' is followed by the subjunctive when the predicate of the sentence is in its clause, as—
No event *can be mentioned that was more remarkable.*
Nulla res memorari potest quæ insignior fuerit. (subj.)
He is ungrateful *who returns a kindness without usury.*
Ingratus est qui beneficium sine usura reddit. (Indic.)
There is nothing that has escaped his notice.
Nihil est quod eum fugerit. (subj.)
There is nothing lawful which is unjust.
Nihil licet quod injustum est. (Indic.)

(2) 'Qui' also generally takes the subj. after such expressions as 'est qui,' 'sunt qui,' 'inveniuntur qui,' 'nemo est qui,' 'solus est qui,' &c.

(3) When 'qui' has for its antecedent 'quis' or certain of its compounds, it requires the subj.

(4) Qui also takes the subj. when it signifies 'inasmuch as,' being nearly equivalent to 'quum.'

(5) 'Qui' is often equivalent to 'ut,' as:—'Cæsar sent ambassadors to say,' &c. Cæsar misit legatos qui dicerent, &c.

4. Translate into Latin:—

(*a.*) Cæsar ordered the soldiers to advance when they had seen the enemy.

(*b.*) The Consul was a man of great valour but of little wisdom.

(*c.*) Having taken the city, the conquerors went to the temple of Jupiter.

TRANSLATION.

(*a*) Cæsar milites simul ac hostes viderint progredi jussit.

(*b*) Consul vir magnæ virtutis (*or* magnâ virtute) sed parvæ sapientiæ (*or* parvâ sapientiâ) erat.

(*c*) Urbe capta, victores ad templum Jovis coierunt.

END OF FOURTH YEAR.

FIRST PAPER.

(Two hours and a half allowed for this paper.)

Dictation.

Same as First Year.

Penmanship.

Same as First Year.

Arithmetic.

MALES.

(Solve any TWO *of the following questions.)*

1. A builder buys half an acre of land at 15s. 9d. a square yard; he builds a house upon it at a further cost of £2,094 5s.; what rent per annum must he obtain to realise 9 per cent. on his outlay?

(*a*) ½ ac. at 15s. 9d. per sq. yard = £1905 15s.
(*b*) Cost of house = £2094 5
Total = £4000
∴ £100 : £4000 :: £9 : Rent required.
$\frac{£9 \times 4000}{100}$ = £360. Ans.

2. Eggs are bought thus:—One-fourth of the consignment at 5 for 3d., one-third at 4 for 2½d., one-sixth at 8 for 5d., and the rest—70 dozen—at 6½d. per dozen; the whole is sold at a uniform price of 9d. per doz.; what is the gain per cent.?

(*a*) ¼ + ⅓ + ⅙ = $\frac{9}{12}$ = ¾.
(*b*) ∴ 70 doz. = ¼ of the whole consignment.
(*c*) ∴ the whole = 280 doz. = 3360 eggs.

		s.	d.
(*d*) ¼	of 3360 at 5 for 3d. =	42	0
⅓	,, ,, 4 for 2½d. =	58	4
⅛	,, ,, 8 for 5d. =	29	2
70 doz. at 6½d. per doz. =		37	11
		167	5
280 doz. at 9d. per doz. =		210	0
Total gain =		42	7

(*e*) ∴ 167s. 5d. : 42s. 7d. :: 100 : gain per cent.
or 2009 or 511
$\frac{100 \times 511}{2009}$ = 25$\frac{111}{2009}$ per cent. Ans.

3. A grocer mixes 3 cwt. 15 lbs. of sugar at 11d. per lb. with 10 cwt. 10 lbs. at 4d. per lb. At what price per lb. should he sell the mixture that he may gain 10 per cent.?

(*a*)		d.
3 cwt. 15 lbs., at 11d. per lb. =	351 lb. × 11 =	3861.
10 cwt. 10 lbs., at 4d. ,, ,, =	1130 lb. × 4 =	4520
	1481 lbs. cost.	8381.

(*b*) 100 : 110 :: 8381d. : selling price on whole.
$\frac{8381d. \times 110}{100}$ = 9219$\frac{1}{10}$d. price of 1481 lbs.
(*c*) 9219$\frac{1}{10}$d. ÷ 1481 = 6$\frac{2251}{14810}$d. or nearly 6¼d. per lb. Ans.

FEMALES.

1. A capitalist invested £18,800 in railway stock at 144, the last dividend being 6¼ per cent.; find his annual return at the same rate.

£144 : £18800 :: £6¼ : annual return.
$\frac{£18800 \times 6\frac{1}{4}}{144} = \frac{18800 \times 25}{144 \times 4}$ = £815 19s. 5$\frac{5}{9}$d. Ans.

2. Find the difference between the simple and compound interest on £400 for three years at 3½ per cent.

Compound interest at 3½ per cent. gives $\frac{7}{200}$ of the principal to be added on every year.

$\frac{7}{200}$ =	£400	prin. for 1st year.
	14	
	414	prin. ,, 2nd ,,
$\frac{7}{200}$ =	14·49	
	428·49	prin. ,, 3rd ,,
$\frac{7}{200}$ =	14·99715	
	443·48715	amt. for 3 years.
	400	
	43·48715	comp. int. ,, ,,

Simple int. = $\frac{£400 \times 3\frac{1}{2} \times 3}{100}$ = 42
£1·48715 diff. required.
20
9·743 s.
12
8·916 d.
£1 9s. 8$\frac{111}{125}$d. Ans.

3. A can do ⅔ of a piece of work in 8 hours, B ¾ of the remainder in 2 hours, and C can finish it in 40 minutes; how long will they take to do it if they all work together?

(*a*) A does ⅓ in 8 hours ∴ he does $\frac{1}{12}$ in 1 hour.
B does ¾ of ⅓ in 2 hours ∴ he does ⅛ in 1 hour.
C does 1 − (⅔ + ¼) = $\frac{1}{12}$ in 40 minutes, or $\frac{1}{8}$ in 1 hour.
(*b*) Total done in 1 hour = ($\frac{1}{12}$ + ⅛ + $\frac{1}{12}$) = $\frac{4}{8}$.
(*c*) All working together they will do the whole in 1 ÷ $\frac{4}{8}$ hours, or $\frac{8}{4}$ = 3$\frac{1}{4}$ hours. Ans.

4. A grocer mixes teas at 3s. a lb. and 2s. a lb., and by selling the mixture at 3s. 6d. he gains 33⅓ per cent.; in what proportion were the teas mixed?

First, the mixture must be made for selling at 2s. 7½d., the prime cost of 3s. 6d. mixture.

2s. 7½d. {	3s.	7½d.	15 or 5
	X		
	2s.	4½d.	9 or 3

Therefore the mixture is 5 lbs. of 3s. : 3 lbs. of 2s. tea. Ans.

Euclid.

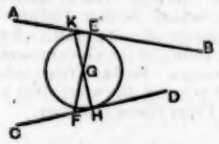
1. If a straight line be divided into any two parts, the square on the whole line is equal to the square on the two parts, together with twice the rectangle contained by the two parts.

Euclid, Book II., Prop. 4.

2. In equal circles, equal angles stand on equal arcs, whether they be at the centres or circumferences.

Euclid, Book III., Prop. 26.

3. Describe a circle to touch two given straight lines, touching one of them in a given point.



Let AB, CD be two given straight lines, and E a given point in AB. It is required to describe a circle to touch AB in the point E, and also to touch CD. From E draw EF at right angles to AB, and meeting CD in F. Bisect EF in G, and draw GH perpendicular to CD, and produce HG to meet AB in K. Then, because EG = GH; and the angles at E and H are right angles, and also the angle EGK = angle HGF ∴ the triangles are (I. 26) equal in every respect, and ∴ EG = GH, and ∴ if a circle be described from the centre G at the distance GE or GH, it will touch AB in E, and CD in H.

Let EHL be the circle. Then because AB and CD are drawn at right angles to the extremities of the radii GE and GH, they will touch the circles in the points E and H respectively.—Q.E.F.

Algebra.

(*Solve any* TWO *of the following questions.*)

1. Find the G.C.M. of $5x^3 - 24x^2 - 75x - 14$ and $10x^3 - 53x^2 - 116x - 21$.

$$
\begin{array}{l}
5x^3-24x^2-75x-14)10x^3-53x^2-116x-21(2 \\
\qquad\qquad 10x^3-48x^2-150x-28 \\
\qquad\qquad -1 \mid \quad -5x^2+34x+7 \\
\qquad\qquad\qquad\quad 5x^2-34x-7 \\
5x^2-34x-7)5x^3-24x^2-75x-14(x+2 \\
\qquad 5x^3-34x^2-7x \\
\qquad\qquad 10x^2-68x-14 \\
\qquad\qquad 10x^2-68x-14
\end{array}
$$

G.C.M. = $5x^2 - 34x - 7$. Ans.

2. Solve the equation, $(x + 2)^2 = 4(x - 1)^2$.

$$(x + 2)^2 = 4(x - 1)^2$$

Taking root of each side $x + 2 = 2x - 2$

$$x = 4. \text{ Ans.}$$

3. A piece of land is worth twice its original price of £20. It is all sold except 15 acres and £100 cleared in money. How much land is there?

Let x = No. of acres

then $x - 15$ = No. sold

$$\therefore 40(x - 15) - 20(x - 15) = 100$$
$$40x - 600 - 20x + 300 = 100$$
$$40x - 20x = 600 + 100 - 300$$
$$20x = 400$$
$$x = 20 \text{ acres. Ans.}$$

Mensuration.

The radius of the outer boundary of a circular ring is 18 feet, and the area of the ring 300 square feet; find the radius of the inner boundary.

(*a*) Area of whole circle = $18^2 \times 3{\cdot}1416$

" = 1017·8784 sq. ft.

Deduct area of ring = 300 "

∴ Area of inner circle = 717·8784

(*b*) Hence radius of inner boundary = $\sqrt{\frac{717{\cdot}8784}{3{\cdot}1416}}$

" " " = $\sqrt{228{\cdot}5}$

" " " = 15·1 ft. Ans.

Grammar.

'Then shall thy name through all my verse be spread
Thick *as* the flowers in meadow lie,
And when in future times they *shall be read*
(*As sure*, I think, they will not die),
If any critic *doubt* that they *be mine*,
Men by that stamp shall quickly know the coin.'

1. Give a general analysis of the above passage.

2. Parse fully the words in *italics*.

GENERAL ANALYSIS.

A. 'Then shall thy name . . . be spread thick'—*prin. sent.*
*a*1. 'As the flowers . . . . lie'—*subord. adv. sent. to A.*
B. 'And men by that stamp . . . . coin'—*prin. sent.*
b 1. 'When in future . . . read'—*sub. adv. (time) sent. to B.*
b 2. 'If any critic doubt'—*subord. adv. sent. (condition) to B.*
b 3. 'That they be mine'—*subord. noun sent to b* 2.
The parenthetical clause may be analysed thus:—
C. 'I think (it) as sure'—*prin. sent.*
*c*1. 'That they will not die'—*subord. noun sent.*

PARSING.

As—subord. conj., introd. adv. sent. of 'manner.'
shall be read—irreg. trans. verb, *read, read, read*, pass. indic., fut., 3rd pers., pl., agreeing with subj. 'they.'
N.B.—'*shall*' may be parsed also as an auxil., '*be*' as an infin., and '*read*' as a pass. part.
as—a subord. conj., almost equal to a prep. 'for,' gov. 'thing' understood—'*as a sure thing.*'
sure—adj. used substantively, or qual. 'thing.'
'*as sure*' may be equivalent to 'assured' or 'certain,' *i.e.*, 'the fact that they will not die.'
doubt—reg. trans. verb, subj. or cond. mood, pres., 3rd pers. sing., agr. with 'critic.'
be—irreg. subs. verb, *am, was, been*, subj. mood, pres., 3rd. pers., plural, agr. with 'they.'
mine—1st pers. pron. (gender of speaker), poss., predic. of 'they.'

3. At what times, and under what circumstances, has the English language been enriched by words of Latin derivation?

Latin words have been introduced into the English language at four different periods. The words of Latin origin that have survived from the First Period (A.D. 43-446) are connected with the military stations and great Roman roads.

The close connection of the English and Romish Churches under St. Augustine, translations, and commerce led to the introduction of classical words and ecclesiastical terms in the Second Period (A.D. 596-1066). A much larger number of words of Latin origin came to us through the Norman-French, which was the language of the Court and of the nobility and gentry during what is called the Third Period (A.D. 1066-1480).

The revival of learning, the invention of printing, the great religious and political controversies of the 16th and 17th centuries, the study of science and philosophy, and the study of classical literature in schools and universities have all contributed to augment our stock of words of Latin origin during the last 400 years.

4. Name the authors of—'Tales of a Grandfather,' 'The Lord of the Isles,' 'The Vision of Mirza,' 'Lady Clare,' 'Boadicea,' 'Robinson Crusoe,' 'Essay on Man,' 'The Cotter's Saturday Night.'

Sir Walter Scott wrote 'Tales of a Grandfather' and 'Lord of the Isles;' *Addison* wrote 'The Vision of Mirza;' *Lord Tennyson*, 'Lady Clare;' *Southey*, 'Boadicea;' *Defoe*, 'Robinson Crusoe;' *Pope*, 'Essay on Man;' and *Burns*, 'The Cotter's Saturday Night.'

SECOND PAPER.

(*Three hours allowed for this paper.*)

Geography.

1. Draw an outline map of North America, showing the mountains and river systems, and these towns: Washington, Quebec, San Francisco, Vera Cruz, Cincinnati, New Orleans.

2. Write an explanatory note on any four of the following:—Golden Horn, Maories, Boers, Parsees, North-West Passage, Llano.

The 'Golden Horn' is an arm of the Bosporus which forms the harbour of Constantinople, and contains ships of all nations. It is one of the most picturesque harbours in the world.

The 'Maories'—the natives of New Zealand—are a brave and intelligent race. They are, after a stubborn resistance, now learning agriculture, and they are rapidly disappearing as a distinct race.

The 'Boers' is the name given to the people in the Transvaal. The word means 'farmers,' and they are the descendants of the original Dutch settlers of Cape Colony. Becoming discontented with British rule in the Cape, they first migrated to Natal, and then again to the Orange River Republic and the Transvaal.

The 'Parsees' (or Persians), formerly adherents of Zerdusht, who lived in Persia till the middle of the seventh century. This monarch being defeated in a great battle, his followers fled to Bombay where they have become a flourishing and important community.

3. Why does the length of *twilight* vary in different parts of the earth? Where is twilight *longest*? Where *shortest*? Where *constant* for certain periods?

Twilight, which is an effect of the light reflected from the higher strata of the atmosphere, *begins* or *ends* at the time when the sun is at a certain depression below the horizon, the depression depending upon the state of the atmosphere for the time being. In the fogs of winter, darkness comes on almost immediately after sunset, while on a clear summer evening the broad light of day will continue for *more than an hour in our latitude*.

In tropical climates the sun descends and ascends almost perpendicularly to the horizon, and therefore its apparent motion is so rapid that the interval between light and darkness *is very short*.

In higher latitudes he approaches more obliquely to the horizon, and moves more obliquely to it after he has set. This causes his vertical descent and ascent to be more slowly made, and thus the duration of *twilight is increased*. The increase is apparently greater in consequence of the eye having time to accommodate itself to the diminished light. In the Arctic regions the twilight is almost constant during one half of the year.

History.

(*Answer any two of the following questions.*)

1. Give a concise account of the Indian Mutiny.

2. What was the state of Scotland under the Protectorate?

3. Give some account of the chief ministers in the reign of George III.

4. How has Scotland been affected by the Union with England? In what respects has it been satisfactory, compared with the Irish Union?

(1) The Indian Mutiny began at Meerut, near Delhi, 10th March, 1857. After killing some Europeans the rebels marched to Delhi, but before they got possession of the city, word was telegraphed to Lahore. Full of sepoys, the city was besieged by 3,000 Europeans from June till September, when it was taken by Sir John Lawrence.

When the mutiny broke out, about a thousand British men, women, and children were in Cawnpore. Taking refuge in the hospital they were attacked by a large force of Sepoys under Nana Sahib, who, after a three weeks' siege, offered to let them go to a place of refuge. The British trusting to his promise, embarked in boats for the purpose of floating down the Ganges to Allahabad. No sooner were they on board than the Sepoys shot down all the men but four, and made prisoners of about two hundred women and children, who a few days after were cruelly massacred.

The Sepoys had also revolted in Lucknow and besieged the Residency in which Sir Henry Lawrence and the Europeans had taken refuge. Havelock arriving at Cawnpore too late to save the victims there, pushed on to relieve those in Lucknow. Sir James Outram joined him on the road and gradually the British won their way, and at last entered Lucknow in triumph. Havelock and Outram soon found that the women and children could not be removed in the face of the enemy who again surrounded the city. Two months later Sir Colin Campbell arrived with a larger army and took all to a place of safety. Delhi had already been re-taken, and the mutiny came to an end by the fall of Bareilly, in 1858.

(2) The greatest among the great enterprises undertaken by the Long Parliament had been the union of the three kingdoms, and that of England and Scotland had been brought about at the very end of its career by the tact and vigour of Sir Harry Vane. But its practical realization was left to Cromwell. In four months of hard fighting General Monk brought the Highlands to a new tranquility, and the presence of an army of seven thousand men backed by a line of forts kept the most restless of the clans in good order. The settlement of the country was brought about by the temperance and sagacity of Monk's successor, General Deane. No further interference with the Presbyterian system was attempted than the suppression of the General Assembly. But religious liberty was firmly protected, and Deane ventured even to interfere on behalf of the miserable victims whom Scotch bigotry was torturing and burning on the charge of witchcraft. Even steady royalists acknowledged the justice of the Government, and the wonderful discipline of its troops. Burnet afterwards said, 'We always reckon those eight years of the usurpation a time of great peace and prosperity.'—From *Green's History*.

Composition.

Explain, as to a class, what a Colony is.

Colony, in Latin *Colónia*, a word derived from *cólere*, to till or cultivate the ground, originally signified a number of people transferred from one country or place to another where lands were allotted to them. The people themselves were called *colóni*, a word corresponding to our term colonists. The meaning of colonies was extended to signify the country or place where colonists settled, and is now often applied to any settlement or land possessed by a sovereign state upon foreign soil. The present notion of the word colony seems to be a foreign country, either wholly or partly colonised, that is to say, possessed and cultivated by natives or the descendants of natives, of another country, and standing in some political connection with, and subordination to, the mother-country. The notion of a British colony implies that the waste lands belong to the British crown. Thus, New Zealand, Australia, and Ceylon, are colonies, but the continental possessions called British India are not a colony.

Teaching.

1. Mention the chief difficulties in teaching composition, and the best means of overcoming them; *or*

2. Write notes of a lesson on subordinate sentences.

SUBORDINATE SENTENCES.

I. Introduction.—Write on Blackboard a few sentences such as follow:—'That did it,' 'when he came,' 'where he was,' 'that he could not do it.' By judicious questioning the pupils will see that the meaning is incomplete—in fact, that the principal part is wanted. Repeat a few more such sentences to let them see the impossibility of getting a complete meaning out of a sentence beginning with such conjunctions as 'when,' 'where,' &c., unless interrogative.

II. Get them to complete these sentences in this way. '*The boy* that did it *was punished*.' '*I was in* when he came.' '*I knew* where he was.' '*They heard* that he could not do it.' Call attention to the fact that there is a principal part and a second one depending on it.

III. (*a*) Expand a simple sentence into a complex one to illustrate the *noun sentence*: 'He wished *to die in battle*' into 'He wished *that he would die in battle*,' &c.

(*b*) Expand to show the adjective sentence: 'There is a tall boy' into 'There is a boy *that is tall*,' &c.

(*c*) Expand to show adverb sentence: 'My sister will come presently.' 'My sister will come *as soon as she is ready*,' &c.

IV. Introduce the names subord. noun, subord. adj., subord. adv. sentences, and give plenty of exercises. Show that the same connective may begin any of these, as:—I knew *where he fell* (noun), I knew the place *where he fell* (adj.), I stood *where he fell* (adv.).

Needlework.

Make a calico band, on it work a button-hole, and hem, whip, and set on a frill.

Latin.

1. Translate :—

Eripiunt subito nubes cœlumque diemque
Teucrorum ex oculis ; *ponto* nox *incubat* atra.
Intonuere poli, et crebris micat ignibus æther ;
Præsentemque viris intentant omnia mortem.
Extemplo Æneæ solvuntur frigore membra ;
Ingemit, et duplices tendens ad sidera palmas,
Talia voce refert ; 'O terque quaterque beati
Queis ante ora patrum Trojæ sub mœnibus altis
Contigit oppetere ! o Danaum fortissime gentis
Tydide, mene Iliacis occumbere campis
Non *potuisse*, tuaque animam hanc effundere dextra ?'

2. Parse and explain the construction of the words in italics.

3. Show by example how Latin usage supplies the want of a perfect participle active.

4. Translate into Latin :—

These barbarians do not cultivate the fields and have no fixed dwellings, but they feed (pasco) oxen and sheep, and wander about in waggons with their wives and children. They live on milk and flesh, they do not use silver and gold, and they are clothed with skins. Having been taught to ride from early youth, they are excellent horsemen, and they fight with much fierceness and bravery.

OPTIONAL.

5. Translate :—

Equestribus proeliis saepe ex equis desiliunt ac pedibus proeliantur, equosque eodem remanere vestigio adsuefecerunt, ad quos se celeriter, cum usus est, recipiunt ; neque eorum moribus turpius quicquam aut inertius habetur quam ephippiis (*saddles*) uti. Itaque ad quemvis numerum ephippiatorum equitum quamvis pauci adire audent. Vinum ad se omnino importari non sinunt, quod ea re ad laborem ferendum remollescere homines atque effeminari arbitrantur.

(1) Suddenly the clouds rob the eyes of the Trojans of sky and light together ; sable night broods o'er the deep. The poles thunder and the firmament glitters with frequent flashes, and all nature threatens the mariners with instant death. Straightway the limbs of Æneas are relaxed with a chilling horror ; he groans, and raising his clasped hands to the stars he utters words like these : 'O thrice and four times blessed they whose lot it was before their father's eyes beneath Troy's lofty walls to die ! O bravest of the Grecian race, son of Tydeus ! Why could I not fall on the plains of Ilium and breathe out my life beneath your right hand ?'

(2) *Ponto*—masc. noun, 2nd decl., *pontus -i*, abl., gov. by 'in' of 'incubat.'
incubat—verb, intrans., 1st conj, *incubo -ui -itum -are*, indic., pres., 3rd pers., sing., agr. with 'nox.'
queis—rel. pron., *qui quæ quod*, anteced. (vos) 2nd pers., mas., pl. dat., gov. by the impers. verb 'contigit.'
contigit—verb, 3rd conj., used impersonally, *contingo -tigi -tactum -tingere*, indic., pret., 3rd pers. sing.
potuisse—intrans. verb, *possum, potui, posse*, infin., perf.

(3) The want of a perfect participle act. in active verbs is supplied in Latin either by the finite verb active, *with relative* or *particle*, or by an *ablative absolute passive* : as, 'Tarquinium regem qui non tulerim alium ?' *Having refused to endure Tarquinius as king, shall I endure another ?* 'Alexander quum interemisset Clitum, vix a se manus abstinuit,' *Alexander having slain Clitus, hardly refrained from suicide.* 'Castris positis hostes expectavit,' *Having pitched his camp he waited for the enemy.*

(4) Hi barbari agros non colunt et nullas certas sedes habent ; sed boves et oves pascunt, et cum uxoribus puerisque in carris vagantur. Lacte et carne vivunt ; nec argento nec auro utuntur ; atque pellibus sunt vestiti. Docti ad equitandum ab adolescentia prima, equites eximii sunt, et ferocitate et virtute magna pugnant.

(5) In cavalry engagements they often leap down from their horses and fight on foot, and they have accustomed their horses to remain on the same spot (footprint), to which they betake themselves when there is occasion ; nor, according to usage, is anything more disgraceful or more slothful than to use saddles. Accordingly they have the courage, however few they may be, to advance against any number of caparisoned cavalry. Wine they do not on any account allow to be imported to them, because by it they believe that men become enervated to endure labour, and are made effeminate.

Our Certificate Class.

BY DR. GEORGE BEACH, M.A.

Head Master of Christ Church Schools, Macclesfield, Joint author of 'Our Mother Tongue.'

GENERAL REMARKS.

1. We recommend our Pupils to continue their studies according to our directions, even though we have not been able to obtain a straightforward answer from the Department, as to the obligation to take First Year Papers.

We have, however, strong reasons for believing that this new condition will not be enforced for the next Certificate Examination ; the Revised Code in its entirety may not come into force for a year, or it may even be abandoned altogether.

2. The *Model Certificate Answers* now appearing in THE PRACTICAL TEACHER should be carefully studied.

3. Our lady friends should carefully note Miss Warren's articles on '*Practical Needlework in Elementary Schools*,' as they bear directly upon the school management paper, and by no means obliquely upon the certificate curriculum.

4. When our examinees have any spare time, either through being able to do more than the month's specified work, or through thoroughly knowing it already, they should practise answering questions, such as the selected ones (previously set) which we give on Paraphrasing, History and Parsing, or prepare their Music.

5. The notes in 'Lewis' Bacon' very materially assist the Paraphrasing ; often the very expressions required are given.

MALES.

EUCLID.

It will be noted that as far as the *text* is concerned, we have, consistently with our system, directed only the Fourth Book to be acquired, whilst ample time is given to the *revision* of the first three books.

In the *Fourth Book* there are no indirect methods of proof, for all the sixteen propositions are problems. There is not a single theorem, whilst in the Third Book, as stated last month, no less than thirty-one thirty-sevenths are theorems.

The Fourth Book really consists of little else than the application of the theorems of the Third to the inscription of figures in circles, and of circles in regular figures. In not a single diagram is the circle absent. Euclid has not given any instances of the inscription or circumscription of rectilineal figures in or about other rectilineal figures.

The first five Propositions relate to triangles *of any kind*, but the remaining nine to *regular* polygons only. No figure with a greater number of sides than a quindecagon is treated of, but as we are taught how to divide the circumference of a circle into 2, 3 and 5 equal parts, we know how to inscribe polygons of 2^n sides, of $3(2^n)$ sides, of $5(2^n)$ sides, and of $15(2^n)$ sides, *i.e.*, of 4, 8, 16, 32 ..... sides, of 3, 6, 12, 24.....sides, of 5, 10, 20, 40.....sides, and of 15, 30, 60.....sides.

In connection with this Book must be studied the first corollary of Euclid, I. 32, as by this means we can find the magnitude of the angle of any regular polygon.

Thus if n = number of sides of the polygon, there are n angles, and

n angles + 4 right angles = $2n$ right angles
$\therefore$ n angles = $(2n - 4)\,90^\circ$
$\therefore$ 1 angle = $\frac{2n - 4}{n}\,90^\circ$.

So that substituting for n the numbers 3, 4, 5, ... 10, we obtain the magnitude of the angles of an equilateral triangle, a square, a pentagon, ...a decagon to be 60°, 90°, 108°, ... 144°, or expressed in terms of a right angle $\frac{2}{3}$, 1, $1\frac{1}{2}$, $1\frac{2}{3}$, $1\frac{4}{5}$, $1\frac{5}{6}$, $1\frac{6}{7}$, $1\frac{7}{8}$, &c.

Remember that though any rectangle can be inscribed within a circle, only an equilateral one (not a square) can be circumscribed, that a circle which touches one side of a triangle and the two other sides produced is called an *escribed* circle, that by Euclid IV., 10, we can divide a right angle into fifths, and that only regular figures of *three, four* and *six* sides can fill up space round a point.

Now the space round a point is four right angles, and if θ represent the magnitude of the interior angle of a regular polygon, so that $\theta = \frac{2n-4}{n} \times 90°$ (see supra), then $4 \times 90° \div \frac{2n-4}{n} \times 90°$ must be an integer, if the angle of the figure is exactly to be a measure of four right angles.

$\therefore$ also $\frac{4n}{2n-4}$ = an integer (by cancelling).

$\therefore \frac{2n}{n-2}$ = an integer; $\therefore$ (by dividing) $2\frac{4}{n-2}$ = an integer; $\therefore \frac{4}{n-2}$ = an integer.

Now the only *integral* measures of 4 are 1, 2 and 4; so that

$n - 2$ must = 1 or 2 or 4
and n must = 3 or 4 or 6. *Q. E. D.*

ENGLISH.

PARAPHRASING, ETC.

Macbeth.—Act III., Scene 1, Lines 48—69.

We are much disturbed by Banquo, for the ruling feature of his kingly disposition demands reverence. He hesitates at no risk, yet he unites with intrepidity a wise discretion that prevents his courage becoming rashness.

I dread no one except him, but in him my spirit recognises its superior, just as Marc Antony crouched before Cæsar.

When the witches saluted me king, he rebuked them and commanded them to transfer their predictions to himself. Then they foretold that his posterity should become a dynasty, that although I should myself reign, yet that I should not transmit my crown to my descendants, but that it should be snatched from my grasp by a stranger, ETC.

Gray's Ode to Eton College.—Lines 81—100.

I can see in the coming years the advent of a ghastly group, diseases and sufferings that render life a misery.

I can discern Rheumatism that tortures the very bones, Fever that scorches the blood, Cramp that agonizes the stretched tendons, with a host of internal disorders; and, to complete the troop, comes Want, whose chilling touch freezes the being, and Age with its gradually enfeebling faculties, ETC.

Bacon's Essays, No. IV.—P. 33, Lines 1—15.

There is a sort of rude equity in Retaliation, nevertheless the more our dispositions grow towards vindictiveness, the greater should be the legal measures adopted to eradicate it.

The avenger is worse than the original transgressor, for the former usurps the functions of the law, whilst the latter simply breaks it.

If we ignore an offence we act a royal part, and rise above our foe, whereas by retaliation we can only reach his level, ETC.

OBSERVATIONS.

The following passages have been previously given for Paraphrasing at the Certificate Examinations:—

Macbeth.

Lines 13— 22, p. 34, Act III., Scene 2 (1870).
Lines 144—155, p. 50, Act IV., Scene 1 (1870).
Lines 49— 56, p. 19, Act II., Scene 1 (1876).
Lines 40— 45, p. 66, Act V., Scene 3 (1876).
Lines 52— 80, p. 13, Act I., Scene 5 (1882).
Lines 47— 71, p. 31, Act III., Scene 1 (1882).

Gray's Odes.

Ode VI., 'The Bard,' Lines 125—134, p. 37 (1870).
Ode V., 'Progress of Poesy,' Lines 66—82, p. 26 (1870), *Prose Order.*
Ode V., 'Progress of Poesy,' Lines 83—94, p. 27 (1871).
Ode XII., 'Pleasure from Vicissitude,' Lines 25—40, p. 54 (1871).
Ode VI., 'The Bard,' Lines 49—60, p.p. 32, 33 (1872).
Ode X., 'Death of Hoel,' Lines 1—10, p. 47 (1873).

Bacon's Essays.

Essay XI., 'Of Great Place,' Lines 8—12, p. 66 (1878).
Essay XX., 'Of Counsel,' Lines 17—24, p. 124 (1878).
Essay LII., 'Of Ceremonies and Respects,' Lines 30—44. pp. 298, 298 (1880), *Prose Order.*
Essay XXXIII., 'Of Plantations,' Lines 8—28, p. 193 (1882).
Essay XI., 'Of Great Place,' Lines 22—41, pp. 67, 68 (1882).
Essay VI., 'Of Simulation and Dissimulation,' Lines 7—10, p. 42 (1884), *Prose Order.*
Essay XI., 'Of Great Place,' Lines 26—29, p. 68 (1884), *Prose Order.*
Essay XVIII., 'Of Travel,' Lines 14—17, p. 111 (1884), *Prose Order.*
Essay XXVII., 'Of Friendship,' Lines 8—12, p. 156 (1884), *Prose Order.*
Essay IX., 'Of Envy,' Lines 21—23, p. 56 (1886).

ARITHMETIC.

TRAIN QUESTIONS.

Principles.

(1) Let D = distance in miles, T = time in hours, R = number of miles traversed per hour, then

$$D = TR;\ T = \frac{D}{R};\ R = \frac{D}{T}.$$

(2) The segments of the road traversed by two trains, starting at the same time, are to each other as the rates of speed, *e.g.*:—

Two trains, going respectively at the rates of 40 and 30 miles per hour, start at the same time from places 210 miles apart. Where will they meet?

The faster train will traverse $\frac{4}{7}$ the distance of the slower train and thus $\frac{4}{7}$ of the whole. It will thus have travelled 120 miles, while the slower has gone 90.

(3) The time required by each train to traverse equal distance, will be *inversely* as their speeds.

(4) When two trains start at different times, calculate (either relatively or absolutely) the distance travelled in the interval, and then, for the remaining portion of the distance, assume that the trains start at same time.

(5) In calculating the time required for two trains (&c.) to pass each other, divide the sum of their lengths by the sum of their rates of speed. The formula $T = \frac{D}{R}$ [see Principle (1)] then becomes $T = \frac{L + L_1}{R + R_1}$, where L and L_1 = the different lengths, and R and R_1 the different speeds.

Two trains, going respectively at 20 and 30 miles per hour, and 350 and 150 yards long respectively, pass each other. What time is required for this?

$T = \frac{L + L_1}{R + R_1}$, $T = \frac{350}{1760} + \frac{150}{1760}$ hours, $T = \frac{500}{1760} \times \frac{1}{30}$ hours, $T = \frac{1}{1056}$ hour.

It is plain also that having given any *four* of these five quantities the fifth can be found. *Caution.* Take care to reduce your distances to miles, your time to hours, your rates of speed to miles per hour.

Exercises.

(a) *A train 400 yards long, going at 20 miles per hour, passed another train, travelling at 15 miles per hour, in 2 miuutes. How long was the second train?*

$$T = \frac{L + L_1}{R + R_1}, \frac{1}{30} = \frac{\frac{2}{3} + L_1}{20 + 15}, \text{ &c.}$$

(b) *A train 400 yards long, going at 20 miles per hour, passed another train 600 yards long in 2 minutes. What was the speed per hour of the second train?*

$$T = \frac{L + L_1}{R + R_1}, \frac{1}{30} = \frac{\frac{2}{3} + \frac{1}{44}}{20 + R_1}, \text{ &c.}$$

HISTORY.

The special period now under study *was prescribed also for the years 1871, '72, '73, and '74.* We append a few questions, selected by comparison with those of more recent years, to show the bent of the inquisitorial mind.

(1) The constitutional office of the Privy Council under William III.

(2) The union of Scotland with England, and its resistance to that measure.

(3) The chief exploits of our Navy from 1685 to 1788.

(4) The foundation and extension of British power in India.

(5) Describe the state of parties in the Convention Parliament of 1689, the arrangements made for the settlement of the crown and for the protection of the subject's liberties.

(6) The war of the Spanish Succession and the part taken by England in it.

(7) The rage for speculation illustrated by the Mississippi Scheme, the South Sea Bubble, and other companies of the same period.

(8) The immunity of juries; its importance and how established.

(9) Relations of James II. to Louis of France; and the conditions of the Treaty of Utrecht.

(10) The career of Monmouth and the movement in Scotland contemporary with his end.

(11) What was the occasion of the Septennial Act? What change did it introduce?

(12) The capitulation of Lord Cornwallis and its consequences.

ALGEBRA.

THE THREE PROGRESSIONS.

In addition to understanding and being capable of applying the ordinary formulæ, it is absolutely necessary to grasp the various relations between the Progressions.

These are well shown in Problems 7, 8, 9, 13 and 14 of Examples XXXII., p. 280, of Todhunter's 'Larger Algebra.'

Problem 7.

(1) b^2 is $> ac$, if a, b, c are in A.P.

For let d = the common difference, then $b = a + d$, and $c = a + 2d$.

The Progression $\therefore$ is $a, a + d, a + 2d$.

$(a + d)^2$ is $> a(a + 2d)$ evidently by d^2.

(2) $b^2 = ac$ if a, b, c are in G.P.

For let r be the common factor, then $b = ar$, and $c = ar^2$.

The Progression is $\therefore a, ar, ar^2$.

$(ar)^2$ is evidently equal to $a(ar^2)$.

(3) b^2 is $< ac$ if a, b, c are in H.P.

For $\therefore \frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P., and by (1) $\frac{1}{b^2} > \frac{1}{ac}$, $\therefore b^2 < ac$, *because if there be two numbers one of which be greater than the other, then the reciprocal of the greater number shall be less than the reciprocal of the smaller.*

FEMALES.

ENGLISH.

Paraphrasing. (Lines 8—28, Act III., Scene 2, Macbeth.)

Lady Macbeth.—What ails you, husband? How is it that you are so unsociable, and spend your time in those melancholy musings, which certainly should have been buried with their object? You ought not to grieve about what you cannot mend. The past is irrevocable.

Macbeth.—We have only postponed not overpast our danger. We shall encounter it as formidable as ever, and it will with its pristine force menace our feeble ill will.

Nevertheless I will upset the whole universe, and disturb heaven and earth rather than spend my days in affright, and my nights in horribly torturing dreams, ETC.

PARSING.

(Lines 47—70 of Macbeth, Act III., Scene 1.)

To be thus, deep, that, be feared, dares, none, but, being, was, of king, speak, father, to be wrenched, son, only, seed, kings.

(Lines 8—26 of Macbeth, Act III., Scene 2.)

Why, keep, alone, making, indeed, on, disjoint, both, better, whom, than, is, his, nor, touch, further.

EXTRA PARSING.

(Lines 10—36 of Macbeth, Act I., Scene 2.)

Worthy, is supplied, like, well, disdaining, till, as, whence, so, armed, dismayed, yes, as, sparrows, eagles, sooth.

(Lines 51—75 of Macbeth, Act I., Scene 3.)

Why, things, fair, that, having, rapt, hail, be, more, how, gentleman, king, stands, whence.

HISTORY.

1660—1685.

Charles II.—Claim to Throne, Character, the Standing Army, Habeas Corpus Act, Petitioners and Abhorrers, Whigs and Tories, Moral Degeneracy of the Nation, Settlement of the Revenue, the Regicides, Poor Law Act, Navigation Act, Corporation Act, Savoy Conference, Conventicle Acts, Five Mile Act, Ecclesiastical Measures in Scotland and Ireland, Second Dutch War, the Quakers, Settlement of Pennsylvania, Fifth Monarchy Men, the Plague, Great Fire of London, Origin of National Debt, the Cabal, Triple Alliance, Treaty of Aix-la-Chapelle, Treaty of Dover, Third Dutch War, Treaty of Westminster, Test Act, Titus Oates, William Bedloe, Meal Tub Plot, Rye House Plot, Three Short Parliaments (1679—1681), Political Plots (1682—1683), Attack on the Charters of Towns, Arbitrary Government, Battles of Pentland Hills and Bothwell Brigg, the Cameronians, Royal Society and Chelsea Hospital founded, Hudson's Bay Company formed.

For an excellent account of 'The Cabinet,' from the pen of the Ex-Premier, see our August Number for 1888, p. 291.

ROUTINE FOR JUNE (MALES).

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Draw up a weekly Routine for a town school of 250 average. Staff.—Head, 2 Assistants, and 3 Pupil Teachers	*Revise* weak points of Euclid to end of Book III., or Deductions to end of 70, Egan, Part II.	Paraphrase Lines 48—69 of Macbeth, Act III., Scene 2	Euclid Deductions First 100 of Egan, Part II.	Paraphrase Lines 81—100 of Gray's Ode on 'Eton College'	How Climate affects national character, both directly and through the diet most suitable	Draw up an Analysis of Gray's 'Elegy'	Map of France	Grammar Answer mentally Questions in *Hewitt's and Beach's 'Our Mother Tongue,'* pp. 79 and 80 (4th Ed.); pp. 39 and 40 (Old Ed.)	Flora and Fauna of Arctic and Antarctic Zones	*Revise* Euclid, Book III.	Read carefully Bacon's Essays, XV. and XVI., pp. 86—104, Lewis' Ed. (with Notes)
TUESDAY	Winds and their causes	Arithmetic — Race and train questions, *e.g.*, Hamblin Smith's Miscellaneous Questions, 83, 190, 195, 214, 238, 268, 371, 417, etc.	*Revise* from 1727—1788 (History)	Arithmetic — Problems involving L.C.M.; *e.g.*, Hamblin Smith's Miscellaneous Questions, 111, 363, 376, 466, etc.	Reign of James II. (Ross, pp. 300—314) 1685—1689	Notes of a Lesson on Emigration	Euclid Deductions — First 130 of Egan, Part II.	Reign of William III., 1689—1702 (Ross, pp. 325—330)	*Capel's Catch Questions*, p. 148	Management of the Voice, Windows, Gas-lights, and Wall Colouring of Schoolroom	*Revise* Any Algebra	*Revise* Reigns of James II. and William III.
WEDNESDAY	Problems involving Simultaneous Quadratics	To end of p. 37, Jevon's Logic Primer	Euclid Deductions First 85 of Egan, Part II	Algebra — Arithmetical Progression	Euclid. — All Book IV.	Write out what you know about the Baconian-Shakesperian controversy	Algebra — Harmonical Progression	Outlines of History to end of Richard II.'s reign	*Paraphrase* 'Revenge is a kind of wild justice ..... angry with a man for loving himself better than me.' Bacon's Essays, No. 4	Euclid Deductions — *Revision*	Read carefully Bacon's Essays XVII.—XIX., pp. 104—121, Lewis' Edition (with Notes)	Map of Ireland
THURSDAY	Write 20 lines of Composition upon 'Liars and swearers are fools, for there are liars and swearers enow to beat honest men'	Write a few copies in *Cowham's 'Mulhauser Manual'*	Euclid — First 9 Propositions of Book IV.	General Geography of France	*Revise* Arithmetic *or* Algebra	Lives of Wallace, The Black Prince, John of Gaunt, Wyclif	Currents and their causes — Tides	Euclid — *Revise* Book II.	What are the average scholar's ordinary defects, and how should they be met?	Algebra — The Three Progressions	Important Dates to end of Richard II.'s reign	*Study Mr. Kinton's Article on Macbeth*
FRIDAY	*Revise* any obsolete or peculiar expressions employed by Shakespere up to end of Macbeth, Act II., Scene 2 See *Kinton's* and Clarendon Press Macbeth	Commerce of England with the Continent	Mensuration of Cylinders *or* Arithmetic	Algebra — Geometrical Progression	*Mr. Cowham's Article on Locke in 'Practical Teacher' for May, 1889.*	Euclid Deductions — First 115 of Egan, Part II.	Write 20 lines contrasting Bacon's practice and his theory of morality	Outlines of History to end of Henry V.'s reign	*Revise* the three Progressions (Algebra)	Notes of a Lesson on 'The Cabinet System'	*Capel's Catch Questions*, p. 179	*Revise* Notes of Macbeth to end of Act II.
SATURDAY	Important Dates to end of Edward II.'s reign	Notes of Macbeth to end of Act II., Scene 4	*Revise* Algebra	Water supply for Schools, Construction of Buildings (To end of p. 67 of *Carpenter's Hygiene*)	Pick out the finest passages in Gray, stating whether they excel in (1) Diction, (2) Melody, or (3) Sentiment	The Summary Register	*Revise* First Book of Euclid	Mensuration of the Sphere *or* Arithmetic	General Geography of British Isles	Euclid Deductions — First 145 of Egan, Part II.	*Read our Article in 'Practical Teacher' for May, 1888*	*Mr. Kinton's Article on Macbeth in 'Practical Teacher' for May, 1889*	General Geography of Spain	Mensuration of the Sphere and Cylinder, *or Revise* Arithmetic	*Mr. Cowham's Article on Locke in 'Practical Teacher' for May, 1889*	Repetition *or* careful reading of Macbeth

ROUTINE FOR JUNE (FEMALES).

DAY	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
MONDAY	Draw up a Weekly Routine for a town school of 250 average. Staff.—Head, 2 Assistants, and 3 Pupil Teachers	Describe six cheap and wholesome dinners for 50 children, stating also cost and amount of material required	Paraphrase Lines 48—69 of Macbeth Act III. Scene 1	What would it cost to clothe 40 girls (ranging from 12 to 15) per year? Give particulars	Paraphrase Lines 8—28 Act III. Scene 2 of Macbeth	Geography of the British West Indies (including their History)	Analyse and Parse difficult words of Macbeth Act III. Scene 2 Lines 8—26	Draw a map of South Africa, shewing British Possessions	Grammar Answer mentally Questions in *Hewitt's and Beach's 'Our Mother Tongue'* pp. 79—80 (4th edition) pp. 39—40 (old edition)	Geography of our South African Possessions	What are the duties of a nurse? Write out about ten plain rules for her guidance	Read carefully Bacon's Essays XV. and XVI. pp. 86—104, Lewis' Edition (with notes)
TUESDAY	All Geography of England	Exercises in Mental Arithmetic	'A form of Apology and Satisfaction to be delivered to His Majesty' (James I.) Any Dates	Arithmetic, beginning at p. 194, *Capel's Catch Questions*	Scotch affairs during the Stuart Period	Notes of a Lesson on Emigration	In your 'Scale Drawing Book' draw the required diagrams; *or* Plain Sewing	Settlement of the Colonies which are now 'The United States'	Arithmetic — Averages	Management of the Voice, Windows, Gaslights and Wall-colouring of Schoolroom	*Revise* Discount, p. 178. *Capel's Catch Questions*	Reign of Charles II. 1660—1685 (Ross, pp. 281—300) *Cox* 403—411
WEDNESDAY	In your 'Scale Drawing Book' draw the required diagrams; *or* Plain Sewing	To end of p. 37 Jevon's Logic Primer	Vaccination. — Its history, theory, advantages and disadvantages. Innoculation	Describe the different methods of patching. Which do you prefer, and why? p. 79, *Jones' Needlework*	How should a Beef-steak, a sole, and a pig's heart be cooked? How would you make a rice, bread and batter pudding?	Write out what you know about the Baconian Shakesperian controversy	What are Consuls, Brokerage, Stocks, Preference Shares, Debentures, &c.? — Practise any Problems	(1) The Army during the Commonwealth. (2) Religious Tolerance during Commonwealth. (3) Development of Sectarianism during Commonwealth	Repetition Lines 39—72 of Act III. Scene 4 of Macbeth, *or* read Macbeth	Practise any cutting-out wherein you are deficient	Read carefully Bacon's Essays XVII.—XIX. pp. 104—121 Lewis' Edition (with notes)	*Revise* Geography of Ireland
THURSDAY	Write 30 lines of Composition upon 'Liars and swearers are fools, for there are liars and swearers enow to beat honest men'	Write a few copies in *Cowham's Mulhauser Manual*	Practise grafting, Swiss Darning, running darn as for heel	Draw a map of West Indies	Explain with examples Factor, G.C.M., Power, Prime Number, Integer, Zero, Ratio, etc.	*Laws* — Appropriating Supplies. — Habeas Corpus	*Revise* any Geography	What are the properties of the fibrin, albumen and gelatine of flesh? How are these affected by salting?	What are the average scholar's ordinary defects, and how should they be met?	Arithmetic. — Partnership, *Capel*, p. 203, sums 4—10; p. 204, sums 18—20	Scotch affairs during the Stuart Period	*Study Mr. Kinton's Article on Macbeth*
FRIDAY	*Revise* any obsolete or peculiar expressions employed by Shakespere up to end of Macbeth, Act II., Scene 2. See *Kinton's* and Clarendon Press Macbeth	Draw a Physical map of Ireland	Arithmetic. — Problems 1, 2, 3, 5, 8, 10, 12, 14 on p. 215, Hamblin Smith	Learn to cut-out imitation lace, &c. in paper, suitable for trimming the various garments	*Mr. Cowham's Article on Locke in 'Practical Teacher' for May, 1889*	How would you diet a person recovering from pneumonia?	Which do you consider the finest essays of Bacon, and why?	Lives and works of Bunyan, Barrow, Bacon, Newton, Coke and Hobbes	What days of the week were or will be March 15th, 1867, May 10th, 1800, Dec. 31st, 1762, and Jan. 2nd, 1899, etc.?	Notes of a Lesson on 'The Cabinet System'	*Revise* any Arithmetic	What puddings are suitable for sick people? Describe the making of three kinds
SATURDAY	Dates of the Commonwealth	Analyse and Parse difficult words of Macbeth Act III. Scene 1 Lines 47—70.	Geography of our South American Possessions	Water supply for schools. Construction of buildings (To end of p. 67 of *Carpenter's Hygiene*)	Continue your list (for future use) of quaint or archaic idioms and constructions of *Bacon*	The Summary Register	*Revise* Outlines of History from 1603—1660	Explain the rules for (1) Reducing Vulgar Fractions to Decimals (2) Finding the L.C.M. and (3) Discuss the relative merits of the Unitary Method and Proportion	*Revise* Geography of Scotland	Practise Stocking-web and a print patch	*Read our Article in 'Practical Teacher' for May, 1889*	*Mr. Kinton's Article on Macbeth in 'Practical Teacher' for May, 1889*	Geography of our South African Possessions	State what you know (mentioning advantages and disadvantages) of Sick, Death, and Benefit Clubs	*Mr. Cowham's Article on Locke in 'Practical Teacher' for May, 1889*	Practise the different darns as before, and darning 'hedge tear'

ARITHMETIC.

DIVISION INTO PROPORTIONAL PARTS.—Hamblin Smith, p. 215.

Sum (1) The parts must be $\frac{1}{11}$ and $\frac{3}{10}$ of the whole.

Sum (2) The parts must be $\frac{3}{10}$, $\frac{5}{10}$, $\frac{1}{10}$, and $\frac{1}{10}$ of the whole.

Sum (3) The proportions existing between $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ are the same as between $\frac{30}{60}$, $\frac{20}{60}$, $\frac{15}{60}$ and $\frac{12}{60}$, or as between 30, 20, 15 and 12. The several parts are therefore $\frac{30}{77}$, $\frac{20}{77}$, $\frac{15}{77}$ and $\frac{12}{77}$ of the whole.

Sum (4) The total amount owing is £1.117 5s. Instead of this only £418 19s. 4½d. is paid. What will be paid instead of £272 10s. ? ETC.

CAPEL'S CATCH QUESTIONS, pp. 194 and 195.

Particularly note problems 1, 6, 9, 18, 20, and 21.

AVERAGES.—See *Hamblin Smith*, pp. 198 and 199, and *Capel's Catch Questions*, 198 and 199, with sums 36, 37, 38, 39, 40 (on page 205), 41, 42, 43, 44, and 45 (on page 206).

Example.—What is the average payment per passenger per mile, of 8 first-class passengers, at 3d. per mile, for 16 miles; 12 second-class, at 2d., for 12 miles; and 18 third-class, at 1d., for 34 miles?

passgrs.	mls.	passgr.	mls.	
8	for 16	= 1	for 128	at 3d. = 384 pence
12	for 12	= 1	for 144	at 2d. = 288 „
18	for 34	= 1	for 612	at 1d. = 612 „
		1	for 884	for 1284d.

$$\therefore 1 \text{ for } 1 = \frac{1284}{884}\text{d.} = 1\frac{400}{442}\text{d.}$$ Answer.

CORRESPONDENCE.

We shall be pleased to reply briefly and through this column to any seeking information or advice. Communications should be addressed 'CERTIFICATE EDITOR.'

Answers demanding urgency will be promptly forwarded per post on receipt of stamped and addressed envelope. A post will be saved by addressing direct to Macclesfield.

Any suggestion tending to the greater utility and interest of these articles, or to the greater convenience of either 'COACH' *or* PUPIL, *will be thankfully received and carefully considered.*

NOVICE (Tadcaster), DAISY (Hendon).—It is very probable that the Revised Code will not come into operation before the next Certificate Examination, if at all; but at all events we feel sure that candidates at Christmas will not require to take First Year Papers. See the letter from Department published in last month's issue.

SCHOLASTICUS.—Lord Cranbrook has promised so to alter the wording of the clause that the 10 square feet requirement shall not apply to schools already existing.

J. P. (Bramley).—Certainly. The changes respecting admission to the profession are all in the direction of increased stringency, but we believe that they will be welcomed by teachers themselves.

A. M. (Amesbury), L. S. (Birmingham), P. (Luton).—We will meet your wishes in the July number. They reach us too late to be satisfied in this month's issue.

J. W. (Maidstone), F. P. (Drighlington), J. C. H. (Congleton), ALPHA (Colchester), H. J. D. (Tonbridge), G. H. (Tunstall), A. M. (Amesbury), J. S. (Eccleshill), and N. —. (Salisbury) answered per ordinary letter.

(To be continued.)

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Locke's Thoughts Concerning Education.

BY JOSEPH H. COWHAM, F.G.S.,

Lecturer on School Method: Westminster Training College.

V.

How to teach writing. Par. 160.

When he can read English well, it will be seasonable to enter him in writing. And here the first thing to be taught him is to hold his pen right; and this he should be perfect in, before he should be suffered to put it to paper: for not only children, but anybody else, that would do anything well, should never be put upon too much of it at once, or be set to perfect themselves in two parts of an action at the same time, if they can possibly be separated. I think the *Italian* way of holding the pen between the thumb and the fore-finger alone, may be best; but in this you may consult some good writing-master, or any other person who writes well and quick. When he has learned to hold his pen right, in the next place he should learn how to lay his paper, and place his arm and body to it. These practices being got over, the way to teach him to write without much trouble, is to get a plate graved with the characters of such a hand as you like best: but you must remember to have them a pretty deal bigger than he should ordinarily write; for every one naturally comes by degrees to write a less hand than he at first was taught, but never a bigger. Such a plate being graved, let several sheets of good writing paper be printed off with red ink, which he has nothing to do but go over with a good pen filled with black ink, which will quickly bring his hand to the formation of those characters, being at first shewed where to begin, and how to form every letter. And when he can do that well, he must then exercise on fair paper; and so may easily be brought to write the hand you desire.

[The method of holding the pen here recommended is not generally adopted by English teachers; it produces a cramped style of handwriting. The use of engraved headlines is almost universal, though some prefer the method of setting copies on either the black board or on sheets specially prepared for class teaching. Children imitate the writing of their teacher more readily than the finished headlines of an engraved copy. The early numbers of all copy books follow Locke's plan in beginning with a larger hand than is usually written, although the large hand exercises are now replaced by a medium text hand. The method of beginning with entire words instead of word and letter elements—straight lines and curves—is not usual with us, and violates the principle which Locke himself enjoins when he says that 'not only children, but anybody else that would do anything well, should never be put upon too much of it at once.' The method of Mulhauser, which has been completely embodied in a series of English copy books, is based upon the above principle; the script forms are first reduced to their elementary characters, and these are introduced gradually, and accompanied as soon as possible by the simple word

forms in which they appear. It appears, therefore, that the system of learning to write recommended by Locke is the opposite of that adopted by Mulhauser. Locke begins with entire words, and by their repeated practice the learner by degrees, and after many failures, comes to fashion each straight stroke and curve correctly, whereas in Mulhauser's system the simple elements are practised first, and when these are mastered they are grouped into complete letters and words—the former method is analytical, the latter is synthetical.]

Drawing.—A Useful Art. Par. 161.

When he can write well and quick, I think it may be convenient not only to continue the exercise of his hand in writing, but also to improve the use of it farther in drawing; a thing very useful to a gentleman in several occasions; but especially if he travel, as that which helps a man often to express, in a few lines well put together, what a whole sheet of paper in writing would not be able to represent and make intelligible. How many buildings may a man see, how many machines and habits meet with, the ideas whereof would be easily retained and communicated by a little skill in *drawing;* which being committed to words, are in danger to be lost, or at best but ill retained in the most exact descriptions? I do not mean that I would have your son a perfect painter; to be that to any tolerable degree, will require more time than a young gentleman can spare from his other improvements of greater moment. But so much insight into *perspective* and skill in drawing, as will enable him to represent tolerably on paper anything he sees, except faces, may, I think, be got in a little time, especially if he have a genius to it: but where that is wanting, unless it be in things absolutely necessary, it is better to let him pass them by quietly, than to vex him about them to no purpose. And therefore in this, as in all other things not absolutely necessary, the rule holds, *Nil invita Minerva.* *

[The connection between writing and drawing here recognised by Locke is sound in theory, and is gradually finding expression in the curriculum of the day school. In the recommendations of the Royal Commissioners on Technical Instruction it is stated 'that rudimentary drawing be incorporated with writing as a single elementary subject, and that instruction in drawing be continued throughout the Standards.' The following articles in the Education Code just issued recognise the importance of the early and continuous instruction in drawing in our infant schools and schools for older scholars:—

1. If the boys (in an infant school) instead of needlework are satisfactorily taught drawing, a grant of 1s. for this subject may be made on the average attendance.

2. No school with an average attendance of 100 boys or more shall receive 15/6 unless *drawing* is satisfactorily taught.

In Locke's article the value of drawing as a means of cultivating a delicacy of touch and a keen appreciation of form, together with a gradual development of a taste for the beautiful, is not mentioned; he appears to be chiefly impressed with the value of drawing as a means of retaining impressions more permanently, and of reproducing them more perfectly than they could be by written language.]

Short-hand, an art, as I have been told, known only in England, may perhaps be thought worth the learning, both for despatch in what men write for their own memory, and concealment of what they would not have lie open to every eye. For he that has once learned any sort of character, may easily vary it to his own private use or fancy, and with more contraction suit it to the business he would employ it in. Mr. Rich's, the best contrived of any I have seen, may, as I think, by one who knows and considers grammar well, be made much easier and shorter. But for the learning this compendious way of writing, there will be no need hastily to look out a master; it will be early enough when any convenient opportunity offers itself at any time, after his hand is well settled in fair and quick writing. For boys have but little use of short-hand, and should by no means practise it till they write perfectly well and have thoroughly fixed the habit of doing so.

The learning of languages.

(a) French. Par. 162.

As soon as he can speak *English*, 'tis time for him to learn some other language. This nobody doubts of, when French is proposed. And the reason is, because people are accustomed to the right way of teaching that language, which is by talking it into children in constant conversation, and not by grammatical rules. The Latin tongue would easily be taught the same way, if his tutor, being constantly with him, would talk nothing else to him, and make him answer still in the same language. But because French is a living language, and to be used more in speaking, that should be first learned, that the yet pliant organs of speech might be accustomed to a due formation of those sounds, and he get the habit of pronouncing French well, which is the harder to be done, the longer it is delayed.

[Locke writes with more than ordinary authority on the teaching of language. His method of teaching both French and Latin was tried with most satisfactory success in several cases under his immediate direction. He strongly insists upon the value of learning any language colloquially. The reasons for teaching a child to speak French in early life are excellent.]

(b) Latin. Par. 163.

When he can speak and read French well, which in this method is usually in a year or two, he should proceed to *Latin*, which 'tis a wonder parents, when they have had the experience in French, should not think ought to be learned the same way, by talking and reading. Only care is to be taken whilst he is learning these foreign languages, by speaking and reading nothing else with his tutor, that he do not forget to read English, which may be preserved by his mother, or somebody else, hearing him read some chosen part of the Scripture, or other English books, every day.

* Do nothing against one's bent or natural aptitude.

Par. 164. Latin I look upon as absolutely necessary to a gentleman; and indeed custom, which prevails over everything, has made it so much a part of education, that even those children are whipped to it, and made to spend many hours of their precious time uneasily in Latin, who, after they are once gone from school, are never to have more to do with it as long as they live. *Can there be anything more ridiculous, than that a father should waste his own money, and his son's time, in setting him to learn the Roman language, when at the same time he designs him for a trade, wherein he having no use for Latin, fails not to forget that little which he brought from school, and which 'tis ten to one he abhors for the ill usage it procured him?* Could it be believed, unless we had everywhere amongst us examples of it, that a child should be forced to learn the rudiments of a language which he is never to use in the course of life that he is designed to, and neglected all the while the writing a good hand, and casting accounts, which are of great advantage in all conditions of life, and to most trades indispensable and necessary? But though these qualifications, requisite to trade and commerce, and the business of this world, are seldom or never to be had at grammar schools; yet thither, not only gentlemen send their younger sons, intended for trades, but even tradesmen and farmers fail not to send their children, though they have neither intention nor ability to make them scholars. If you ask them why they do this? they think it as strange a question as if you should ask them, why they go to church? **Custom serves for reason,** and has, to those that take it for reason, so consecrated this method, that it is almost religiously observed by them; and they stick to it, as if their children had scarce an orthodox education, unless they learned Lilly's grammar.

[Locke evidently looks upon a knowledge of Latin as the possession and badge of a gentleman. The educational value of the study does not appear to enter his mind, and the ridicule which he heaps upon those who learn Latin and are never likely to use it, is proof of the utter failure on his part to recognise any mental discipline in the study.]

How to teach Latin. Par. 165.

(a) The conversational method.

But how necessary soever Latin be to some, and is thought to be to others, to whom it is of no manner of use and service; yet the ordinary way of learning it in a grammer-school is that, which having had thoughts about, I cannot be forward to encourage. The reasons against it are so evident and cogent, that they have prevailed with some intelligent persons, to quit the ordinary road, not without success, though the method made use of was not exactly what I imagine the easiest, and in short is this: *to trouble the child with no grammar at all, but to have Latin as English has been, without the perplexity of rules talked into him;* for if you will consider it, Latin is no more unknown to a child, when he comes into the world, than English: and yet he learns English without master, rule, or grammar; and so might he Latin too as Tully did, if he had somebody always to talk to him in this language. And when we so often see a French woman teach an English girl to speak and read French perfectly in a year or two, without any rule of grammar, or anything else, but prattling to her, I cannot but wonder, how gentlemen have overseen this way for their sons, and thought them more dull or incapable than their daughters.

Par 166. If therefore a man could be got, who himself speaking good Latin, would always be about your son, talk constantly to him, and suffer him to speak or read nothing else, this would be the true and genuine way; and that which I would propose, not only as the easiest and best, wherein a child might, without pains or chiding, get a language, which others are wont to be whipped for at school six or seven years together; but also as that, wherein at the same time he might have his mind and manners formed, and he be instructed to boot in several sciences, such as are a good part of *geography, astronomy, chronology, anatomy,* besides some parts of *history,* and all other parts of knowledge of things, that fall under the senses, and require little more than memory. For there, if we would take the true way, our knowledge should begin, and in these things be laid the foundation; and not in the abstract notions of *logic* and *metaphysics,* which are fitter to amuse, than inform the understanding, in its first setting out towards knowledge. When young men have had their heads employed a while in those abstract speculations, without finding the success and improvement, or that use of them, which they expected, they are apt to have mean thoughts, either of learning or themselves; they are tempted to quit their studies, and throw away their books, as containing nothing but hard words and empty sounds; or else, to conclude, that if there be any real knowledge in them, they themselves have not understandings capable of it. That this is so, perhaps I could assure you upon my own experience. Amongst other things to be learned by a young gentleman, in this method, whilst others of his age are wholly taken up with Latin and languages, I may also set down geometry for one; having known a young gentleman, bred something after this way, able to demonstrate several propositions in Euclid, before he was thirteen.

[The object of Locke is to make the learning of Latin a mere exercise of memory, and the acquisition of it of little value for knowledge, and of less for the purposes of mental discipline. The learning in schools of a language like Latin for educational purposes is a very different exercise from that of learning our mother tongue in the nursery. Latin is not made a study merely for the sake of knowing the language; its synthetical character makes the study of its forms and the knowledge and application of its rules the most valuable part of the exercise. Locke's method would produce scholars who would learn Latin, but it would fail to secure the intellectual culture which the study is intended mainly to yield.]

(To be continued.)

Query Column.

RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

General.

1. NONDESCRIPT.—At a place A a certain magnet, free to move in a horizontal plane, makes 10 vibrations in a given time. At another place B, the same magnet, the moment of which has, however, decreased by 10% makes 11 vibrations in the same time. Compare the horizontal magnetic intensities of the earth's field at A and B. (*Magnetism for Training Colleges, November, 1882.*)

Let H be the earth's horizontal intensity at A, and h the intensity at B. Let M be the magnet's moment at A, then at B it is 10 per cent., *i.e.* one-tenth, less, ∴ it is $\frac{9}{10}$ M. Then the law is the ordinary law of small pendulum-like oscillations, namely, that the force (couple) tending to restore equilibrium is proportional to the square of the number of oscillations.

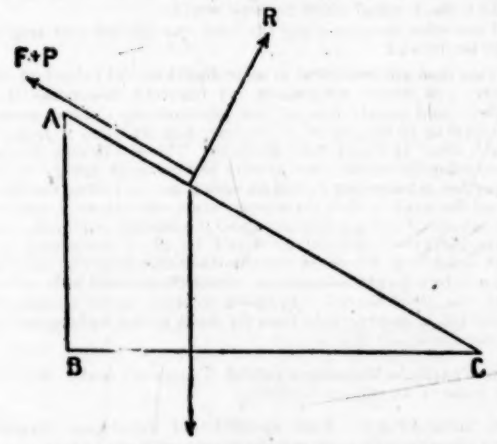
(See on this subject Angell's *Elements*, art. 71, or Guthrie, art. 355, or Sylvanus Thompson's *Elementary Lessons*, art. 120.)

∴ M H is proportional to 10^2, *i.e.*, we have

$$\frac{M\,H}{\frac{9}{10}\,M\,h} = \frac{10^2}{11^2} \quad \therefore \quad \frac{H}{h} = \frac{90}{121}.$$

Hence the horizontal intensities are as 90 to 121.

2. KAPPA.—A body weighing 12 ozs. is partly supported on a rough inclined plane, that rises 1 in 2, by the force of friction, and partly by a force parallel to the plane; if the plane be lowered so as to rise 2 in 5, the force of friction alone will support it; find the additional force in the former case. (*Magnus.*)



Let AC be the inclined plane in which AC = 2 . AB

and ∴ BC = $\sqrt{3}$. AB

and sin ACB = $\frac{1}{2}$

and cos ACB = $\frac{\sqrt{3}}{2}$

The forces acting on the body are—

(i.) W (12 oz.) acting vertically downwards,

(ii.) F (Friction) and P (the force to be found) acting up the plane, and

(iii.) R (the resistance of the plane) acting at right angles to the plane.

If μ = co-efficient of friction

$F = \mu R$,

but by the second condition of the problem

$$\mu = \tan \sin^{-1} \tfrac{2}{5} = \frac{2}{\sqrt{21}}.$$

Resolving these forces along the plane and at right angles to it, we have

(i.) along the plane

$$F + P = W \sin ACB,$$

$$\text{or } \frac{2}{\sqrt{21}} R + P = 12 \times \tfrac{1}{2} \ldots\ldots\ldots\ldots \text{(i)}.$$

(ii.) at right angles to the plane

$$R = W \cos ACB,$$

$$\text{or } R = 12 \times \frac{\sqrt{3}}{2} \ldots\ldots\ldots\ldots \text{(ii)}.$$

(ii.) $\times \frac{2}{\sqrt{21}}$; $\frac{2}{\sqrt{21}} R = 12 . \frac{\sqrt{3}}{2} . \frac{2}{\sqrt{21}}$

(i.) $\frac{2}{\sqrt{21}} R + P = 12 . \frac{1}{2}$

Subtracting (ii.) from (i.)

$$P = 12 \left(\tfrac{1}{2} - \frac{1}{\sqrt{7}} \right) \text{oz.}$$

$$= 12 \left(\tfrac{1}{2} - \frac{1}{2{\cdot}6457513} \right) \text{oz.}$$

$$= (6 - 4{\cdot}535)\ \text{oz.}$$

$$= \underline{1{\cdot}46\ \text{oz.}}\ \text{Ans.}$$

3. ANALYTICAL GEOMETRY.—Find the vertex of an isosceles right-angled triangle, the extremities of the hypotenuse being 1,1 and 3,9; and draw the lines

$$(a) \quad 2y - 3x = 7.$$
$$(b) \quad 5x + 8 = 0.$$
$$(c) \quad 4y + 7x = 0.$$
$$(d) \quad r \cos \left(\theta - \frac{\pi}{3} \right) = 4.$$

(*L.L.A. Examination Questions, 1888.*)

Equation to the straight line passing through two points whose co-ordinates are x_1, y_1 and x_2, y_2 is

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1);$$

∴ Equation of the hypotenuse is

$$y - 1 = \frac{9 - 1}{3 - 1} (x - 1)$$

$$= 4 (x - 1)$$

$$\therefore \underline{y = 4x - 3}.$$

Co-ordinates of the middle point of the hypotenuse are

$$\tfrac{1}{2} (1 + 3) \text{ and } \tfrac{1}{2} (1 + 9)$$

$$= \underline{2 \text{ and } 5}.$$

Equation of the altitude of the triangle, which passes through the point 2, 5, and is perpendicular to the line $y = 4x - 3$, is

$$y - 5 = -\tfrac{1}{4}(x - 2)$$
$$= -\frac{x}{4} + \tfrac{1}{2}$$
$$\therefore y = -\frac{x}{4} + 5\tfrac{1}{2}.$$

Equation to the straight line which passes through a given point and makes a given angle with a given straight line, where h and k are the co-ordinates of the given point, β the given angle, and the equation to the given straight line is $y = mx + c$, is

$$y - k = \frac{m + \tan\beta}{1 - m\tan\beta}(x - h);$$

$\therefore$ Equation of the side of the triangle adjacent to the axis of y is

$$y - 1 = \frac{4 + \tan 45^\circ}{1 - \tan 45^\circ}(x - 1)$$
$$= \frac{4 + 1}{1 - 4}(x - 1)$$
$$= -\frac{5}{3}(x - 1)$$
$$= -\frac{5x}{3} + \frac{5}{3}$$
$$\therefore y = -\frac{5x}{3} + \frac{8}{3}.$$

The co-ordinates of the vertex of the triangle are the co-ordinates of the point of intersection of the straight lines

$$\left.\begin{aligned} y &= -\frac{x}{4} + 5\tfrac{1}{2} \\ y &= -\frac{5x}{3} + \frac{8}{3} \end{aligned}\right\}$$
$$\therefore \frac{5x}{3} - \frac{x}{4} = \frac{8}{3} - 5\tfrac{1}{2}$$
$$20x - 3x = 32 - 66$$
$$17x = -34$$
$$\therefore x = -2.$$
$$y = -\frac{x}{4} + 5\tfrac{1}{2}$$
$$= \tfrac{1}{2} + 5\tfrac{1}{2}$$
$$= 6.$$

$\therefore$ Co-ordinates of the vertex are -2 and 6.

(*a*) $2y - 3x = 7$;
Let $x = 1$,
Then $2y - 3 = 7$
$2y = 10$
$\therefore y = 5.$

Hence the point which has its abscissa = 1 and its ordinate = 5 is on the straight line.

Again, let $x = 2$,
Then $2y - 6 = 7$
$2y = 13$
$\therefore y = 6\tfrac{1}{2}.$

Hence the point which has its abscissa = 2 and its ordinate = $6\tfrac{1}{2}$ is on the straight line.

Join these two points, and the straight line so formed, produced indefinitely both ways, is the locus of the given equation.

(*b*) $5x + 8 = 0$;

This represents a straight line parallel to the axis of y at a distance of $-\frac{8}{5}$ from it, that is, it is on the left of the axis of y.

(*c*) $4y + 7x = 0$;

Since this equation can be satisfied by supposing $x = 0$ and $y = 0$, the origin is a point of the straight line which the equation represents; therefore we need only determine one other point in it.

Let $x = 1$,
Then $4y = -7$
$\therefore y = -1\tfrac{3}{4}.$

Hence another point, whose co-ordinates and 1 are $-\frac{7}{4}$, is determined, and the straight line can be drawn.

(*d*) $r\cos(\theta - \frac{\pi}{3}) = 4$;

This is the polar equation of the straight line, of which the perpendicular on it from the origin = 4, and the angle made by this perpendicular with the initial line = $\frac{\pi}{3}$ or 60°.

Therefore draw a line at the origin making an angle of 60° with the origin, and make its length = 4; then if a straight line be drawn perpendicular to it at the extremity, the line thus drawn will be the locus of the given equation.

4. W. TAYLOR.—A cylindrical body, floating in water with its axis vertical, is immersed, when under an exhausted receiver, to three-fourths of its length; through what proportion of its length will it rise when air is admitted, supposing the specific gravity of air in comparison with water to be ·00122?

Let l be the length of the cylinder in feet, and s be the area of the cross section in square feet. Let w = the weight of 1 cubic foot of water. Then ls is the volume of the cylinder, but it is $\frac{3}{4}$ths immersed, $\therefore \frac{3}{4}\,ls$ is the volume of water displaced, $\therefore \frac{3}{4}\,lsw$ is the weight of water displaced, *i.e.*, the weight of the cylinder.

Suppose that after the admission of air it rises until x feet are above water, *i.e.*, $l - x$ below water. The volume of air displaced is xs cubic feet. But the weight of 1 cubic foot of air is $(\cdot00122)\,w$, $\therefore$ weight of air displaced = $(\cdot00122)\,xsw$. Also weight of water non-displaced is, $(l-x)\,sw$. The sum of these two is the weight of the body.

$$\therefore \tfrac{3}{4}\,lsw = (\cdot00122)\,xsw + (l-x)\,sw.$$

Cancel sw throughout and we have a simple equation for x which gives—

$$\frac{x}{l} = \frac{100000}{399512}.$$

The length that was formerly above water was $\frac{1}{4}$; hence the proportion of its length that the body will rise is—

$$\frac{100000}{399512} - \frac{1}{4} = \frac{61}{199756}.$$

5. A STUDENT OF TRIGONOMETRY.—Define the sine of an angle generally, pointing out the necessary conventions. (*L. L. A. Degree, St. Andrew's.*)

The sine of an angle is the perpendicular divided by the hypotenuse.

(1) As the angle increases from 0 to 90°, the sine increases from 0 to 1.

(2) As the angle increases from 90° to 180°, the sine decreases from 1 to 0.

(3) As the angle increases from 180° to 270°, the sine is *negative*, and increases numerically from 0 to -1.

(4) As the angle increases from 270° to 360°, the sine is *negative*, and decreases numerically from -1 to 0.

6. B. S. B.—In a certain coal-mine is an inclined plane 350 yards long, with a rise of 6 inches to the yard. In connection with it is a level plane, about to be opened. On each plane are two sets of rails for full and empty tubs. Thirty-five full tubs descending the incline, draw 35 empty ones up it by means of an endless rope. A full tub weighs one ton; an empty tub half a ton; the wheels of a tub, four in number, are 10 inches in diameter; the axles are $1\frac{3}{4}$ inches in diameter. It is proposed to draw the two sets of tubs along the level plane, by the same means. At the top and bottom of the incline a shaft is fixed, round which the rope works.

From what distance along the level can the full and empty tubs be drawn?

Your data are insufficient in some directions and redundant in others. If *there is no friction*, 35 full tubs descending the incline could exactly draw 35 *full* tubs from any distance along the level up to the top of the incline, and therefore *à fortiori* could draw 35 empty tubs up to it. This is obvious, for in descending the incline they acquire just as much energy as is expended in ascending it, and no work is used in pulling the tubs along the level, so that there is an exact equivalence between the amount of energy generated and the amount employed. If there is friction some details should be given concerning it. The number of wheels in the tub, their diameter, &c., do not seem to be relevant information. Something would have to be said, too, about the collisions which occurred on the change of either full or empty trucks from the level to the inclined track or *vice versâ*.

7. ELAINE.—Macmillans publish Tennyson's works. We do not know of an annotated edition.

8. SCHOLARSHIP.—Your age will not affect your chance. Your place depends upon your work, not upon your age.

9. H. LORREQUER.—Lessons upon all the points you name have appeared in this journal during the last year.

10. SUBSCRIBER.—The details are very intricate, but your points are all cleared up in recent letters on the subject. You must pass in shading and blackboard.

11. INSECT.—We think a work such as you name has been published by Miss Ormerod.

12. VERULAM.—1. Physiography and Teaching, you have sufficient; Mathematics, your books are old, but good. 2. Read the Syllabus to see what sections you really need. 3. Printers prefer *ise*. 4. You must take shading and blackboard under the new regulations.

13. W. P. B.—We recommend you most strongly to sit for the Scholarship Examination, and then spend two years in training. The other plan may land you in all manner of difficulties.

14. C. W. T.—The degree of Mus. Bac. can be obtained without residence. You have a preliminary examination to pass of a general kind, the rest are technical and professional. Write to the University and ask for the details.

15. I. Z. N.—You do not say so, but you are most likely an acting teacher. You had better begin studying at once. You cannot do better than use the time table printed in this journal and follow the advice there given. You will see by the Code when you can sit, which depends upon circumstances.

16. LORELEI.—Large hand shows promise. It lacks firmness. You hold your pen improperly. 70. The small hand is not so good. It is only large hand written smaller. The forms are wrong. Get a good pen and learn how to hold it, and then practise a quarter of an hour per day for three months. You will be surprised at the result.

Arithmetic.

1. SALOPIAN.—If I sell £5,000 which I had in the Four per Cents., and with the proceeds buy Five per Cents. at 108, and thereby increase my income by £25, at what price do I sell? (*Capel's* 'Catch Questions.')

Income in first case = 4 % on £5,000
= £200;
,, second case = £200 + £25
= £225;
Stock in ,, = £225 × $\frac{100}{5}$
= £4,500;

∴ Price of stock in first case = 108 × $\frac{4500}{5000}$
= $\frac{54 \times 9}{5}$
= $\frac{486}{5}$
= 97$\frac{1}{5}$. Ans.

Note.—This sum is not the converse of No. 10. The answer is corrected in the 7th edition.

2. ROTHER.—A person buys shares in a railway at £19 10s., when £15 has been paid, and after paying a call of £10 per share, sells them again at £32 9s.; how much per cent. does he gain? (*Oxford Responsions.*)

Total amount paid per share = £19 10s. + £10
= £29 10s.,
Gain per share = £32 9s. − £29 10s.
= £2 19s.;

£ s. £ £ s.
∴ 29 10 : 100 :: 2 19 : Gain %
20 20
590 59

= 10 per cent. Ans.

3. M. R.—If the true discount on £461 5s. at 2½ per cent. per annum be £2 5s., when is this sum due? (*Certificate Exam., Scotland, Females, 2nd year, 1888.*)

Present Worth = £461 5s. − £2 5s.
= £459.
Interest on Present Worth for a year = 2½ % on £459
= 459 sixpences
= £11 9s. 6d.;

£ s. d. £ s. year
∴ 11 9 6 : 2 5 :: 1 : Time.
20 20
229 45
2 2
459 90
51 10

= $\frac{10}{51}$ year
= $\frac{3570}{51}$ days
= 71$\frac{13}{17}$ days. Ans.

4. CERTES.—In a bag are 90 shillings, 100 sixpences, and 120 fourpenny pieces; find the least number of threepenny pieces that must be added, so that the whole may be distributed in sums of eighteenpence, no such sum being made up of any one coin exclusively.

90 shillings require 90 sixpences,
∴ There are left 10 sixpences;
120 fourpenny pieces = 40 shillings,
∴ 40 sixpences are required for these;
∴ 30 sixpences or 60 threepenny pieces must be added. Ans.

Algebra.

1. RALPHO.—Find the number of the combinations of the letters in the words *proportion* and *Constantinople*, taken 6 at a time, also when taken 8 at a time.

(*a*) *Proportion.*

There are 10 letters, and *o* occurs three times, *p* and *r* twice, *t*, *i*, and *n* once.

(1) Taken 6 at a time.

(*a*) There is one case in which no letter is repeated.

(*b*) There are 5 cases in which *p* occurs twice, as many in which *r* occurs twice, and as many in which *o* occurs twice; 15 in all.

$\left(\frac{5 \cdot 4 \cdot 3 \cdot 2}{\lfloor 4} = 5\right)$

(*c*) There are 10 cases in which *o* occurs three times.

$\left(\frac{5 \cdot 4 \cdot 3}{\lfloor 3} = 10\right)$

(*d*) There are 6 cases in which *p* and *r* each occur twice, as many in which *p* and *o* each occur twice, and as many in which *r* and *o* each occur twice; 18 in all.

$\left(\frac{4 \cdot 3}{\lfloor 2} = 6\right)$

(*e*) There are 4 cases in which *o* occurs three times and *p* twice, and as many in which *o* occurs three times and *r* twice; 8 in all.

(*f*) There is one case in which *p* occurs twice, *r* twice, and *o* twice.

∴ Number of combinations = 1 + 15 + 10 + 18 + 8 + 1.
= 53. Ans.

2. Taken 8 at a time.

(*a*) Number of cases in which *t*, *i*, *n*, *p*, and *r* occur once and *o* occurs three times = 1.

(*b*) Number of cases in which *o* occurs three times and *p* twice = $\frac{4 \cdot 3}{1 \cdot 2}$ = 6; and a similar number when *r* occurs twice instead of *p*; 12 in all.

(*c*) Number of cases in which *p* and *r* occur twice = 4; a similar number when *p* and *o* occur twice; also when *r* and *o* occur twice; 12 in all.

(*d*) Number of cases in which *p* occurs twice, *r* twice, and *o* twice = $\frac{3 \cdot 2}{1 \cdot 2}$ = 3.

(*e*) Number of cases in which *p* occurs twice, *r* twice, and *o* three times = 3.

∴ Number of combinations = 1 + 12 + 12 + 3 + 3.
= 31. Ans.

(*b*) *Constantinople.*

There are 14 letters, and *n* occurs three times, *o* and *t* twice, and the remaining letters (7) once.

1. Taken 6 at a time.

(*a*) No. of cases in which no letter is repeated
= $\frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5}{\lfloor 6}$ = 210.

(*b*) No. of cases in which *o* occurs twice = $\frac{9 \cdot 8 \cdot 7 \cdot 6}{\lfloor 4}$ = 126; as many for *t* twice, and as many for *n* twice; 378 in all.

(*c*) No. of cases in which *n* occurs three times = $\frac{9 \cdot 8 \cdot 7}{\lfloor 3}$ = 84.

(*d*) No. of cases in which *o* and *t* each occur twice = $\frac{8 \cdot 7}{2}$ = 28; as many in which *o* and *n* each occur twice, and as many in which *t* and *n* each occur twice; 84 in all.

(e) No. of cases in which n occurs three times and o twice = 8; and as many in which n occurs three times and t twice; 16 in all.

(f) No. of cases in which o, t, and n each occur twice = 1.

∴ No. of combinations = 210 + 378 + 84 + 84 + 16 + 1
= 773. Ans.

(2) Taken 8 at a time.

(a) No. of cases in which no letter is repeated = $\frac{10.9}{1.2}$ = 45.

(b) No. of cases in which o occurs twice = $\frac{9.8.7.6.5.4}{\lfloor 6}$ = 168; as many in which t occurs twice, and as many for n twice; 504 in all.

(c) No. of cases in which n occurs three times

$$= \frac{9.8.7.6.5}{\lfloor 5} = 126;$$

(d) No. of cases in which o and t each occur twice = $\frac{8.7.6.5}{\lfloor 4}$ = 70; as many in which o and n each occur twice, and as many in which t and n each occur twice; 210 in all.

(e) No. of cases in which n occurs three times and o twice = $\frac{8.7.6}{\lfloor 3}$ = 56; and as many in which n occurs three times and t twice; 112 in all.

(f) No. of cases in which o, t, and n each occur twice

$$= \frac{7.6}{1.2} = 21.$$

(g) No. of cases in which n occurs three times and o and t each twice = 7.

∴ No. of combinations = 45 + 504 + 126 + 210 + 112 + 21 + 7 = 1,025. Ans.

2. ULVERSTON.—The sum of five numbers in geometrical progression is 121, and the sum of their squares is 7,381. Find the numbers. (*Colenso.*)

Sum in 1st case = $\frac{a(r^5-1)}{r-1}$;

Series in 2nd case = a^2, a^2r^2, a^2r^4, &c.

∴ Sum = $\frac{a^2(r^{10}-1)}{r^2-1}$;

$$\therefore \begin{cases} (1)\ \frac{a^2(r^{10}-1)}{r^2-1} = 7{,}381 \\ (2)\ \frac{a(r^5-1)}{r-1} = 121 \end{cases}$$

$$\frac{a^2(r^{10}-1)}{r^2-1} \times \frac{r-1}{a(r^5-1)} = \frac{7381}{121}$$

$$\frac{a(r^5+1)}{r+1} = 61$$

$$a(r^4 - r^3 + r^2 - r + 1) = 61.$$

$$(2)\ \frac{a(r^5-1)}{r-1} = 121$$

$$a(r^4 + r^3 + r^2 + r + 1) = 121.$$

$$\therefore \frac{r^4 + r^3 + r^2 + r + 1}{r^4 - r^3 + r^2 - r + 1} = \frac{121}{61}$$

$$\frac{2r^4 + 2r^2 + 2}{2r^3 + 2r} = \frac{122}{60}$$

$$\frac{r^4 + r^2 + 1}{r^3 + r} = \frac{61}{30}$$

$$30r^4 + 30r^2 + 30 = 61r^3 + 61r$$

$$30r^4 - 61r^3 + 30r^2 - 61r + 30 = 0$$

$$(30r^4 - 90r^3) - (r^3 - 3r^2) + (27r^2 - 81r) - (10r - 30) = 0$$

$$30r^3(r-3) - r^2(r-3) + 27r(r-3) - 10(r-3) = 0$$

$$\therefore (r-3)(30r^3 - r^2 + 27r - 10) = 0;$$

If we take $r - 3 = 0$,
we obtain $r = 3$.

(2) $a(r^4 + r^3 + r^2 + r + 1) = 121$

$a(81 + 27 + 9 + 3 + 1) = 121$

$121a = 121$

$\therefore a = 1$.

∴ Numbers = 1, 3, 9, 27, 81.

3. ANNIE LINDSAY.—A and B are two stations 300 miles apart. Two trains start simultaneously from A and B, each to the opposite station. The train from A reaches B nine hours and the train from B reaches A four hours after they meet: find the rate at which each travels. (*Hall and Knight's* 'Algebra.')

Let x = Rate of train from A in miles per hour,

And y = " " B " " ;

Then $\frac{300}{x+y}$ = Time in which they meet in hours;

$\frac{300}{x+y} \times x$ = Distance from A in miles,

And $\frac{300}{x+y} \times y$ = " " B " when they meet;

$$\therefore \begin{cases} (1)\ \frac{300}{x+y} \times x = 4y \\ (2)\ \frac{300}{x+y} \times y = 9x \end{cases}$$

$$\frac{300x}{x+y} \times \frac{x+y}{300y} = \frac{4y}{9x}$$

$$\frac{x}{y} = \frac{4y}{9x}$$

$$9x^2 = 4y^2$$

$$3x = 2y$$

$$\therefore y = \frac{3x}{2}.$$

$$(1)\ \frac{300x}{x+y} = 4y$$

$$\frac{300x}{x + \frac{3x}{2}} = 4 \times \frac{3x}{2}$$

$$\frac{600x}{5x} = 6x$$

$$6x = 120.$$

$$\therefore x = 20.$$

$$y = \frac{3x}{2}$$

$$= 20 \times \tfrac{3}{2}$$

$$= 30.$$

∴ Rates = 20 and 30 miles respectively.

Model Answers to Pupil Teacher Examination Papers.

13TH APRIL, 1889.

END OF SECOND YEAR—*continued.*

Arithmetic.

BOYS ONLY.

(Answer three questions only, including the last, if you can.)

1. If 372 men in 8 days of 11 hours each dig a trench 325½ yards long, 7¼ yards wide, and 2⅝ yards deep, in how many days of 9 hours each will 36 men dig a trench 283½ yards long, 4¾ yards wide, and 3½ yards deep?

2. In 15 years a sum of money at 3½ per cent., simple interest, has increased to £457 10s.; how many more years will pass before it amounts to 500?

3. If I divide £5,000 among A, B, and C, and give A £275 more than C, and B £300 less than C, what is B's share?

4. State a rule for finding the Least Common Multiple of two or more numbers. Find the L.C.M. of 2,907, 5,168 and 7,344.

days days.
(1) men 36 : 372 :: 8 : x
hrs. 9 : 11
L. yds. $325\frac{1}{2}$: $283\frac{1}{2}$
B. yds. $7\frac{1}{2}$: $4\frac{3}{4}$
D. yds. $2\frac{3}{8}$: $3\frac{1}{4}$

$$x = \frac{8 \times 372 \times 11 \times 567 \times 19 \times 10 \times 2 \times 3 \times 8}{36 \times 9 \times 2 \times 4 \times 3 \times 651 \times 22 \times 19}$$

cancelling
$x = \underline{80 \text{ days.}}$ Ans.

(2) £100 would make £$3\frac{1}{2} \times 15$ = £$52\frac{1}{2}$, and would become £$152\frac{1}{2}$.

Amt. Amt. Princ. Princ.
$\therefore$ $152\frac{1}{2}$: $457\frac{1}{2}$ :: 100 : 300
£500 − £457 10s. = £42 10s.

If £100 makes £$3\frac{1}{2}$ in a year, how soon will £300 make £42 10s.?

Yr.
£300 : £100 :: 1 : x
£$3\frac{1}{2}$: £$42\frac{1}{2}$
$x = \frac{100}{300} \times \frac{85}{7} \times \frac{1}{365} \times \frac{7}{1}$
$= \underline{4\frac{1}{11}}$ yrs. Ans.

(3) B has £300 less than C, who has also £275 less than A; $\therefore$ B has £575 less than A.

To this £575 add £300 which B has less than C;

$\therefore$ A and C have a total excess of £875 above B, and £5000 − £875 = £4125, to be divided equally among the three. £4125 ÷ 3 = £1375, B's share.

(4) Divide the numbers by their Greatest Common Measure; then multiply the G.C.M. and the quotients together, and the product will be the Least Common Multiple. If of three numbers, find the L.C.M. of two, and then of that L.C.M. and the third, and so on.

```
2907)5168(1
     2907
     2261)2907(1
          2261
          646)2261(3
              1938
              323)646(2
                  646
```

```
323)2907 . 5168
     9 .   16
```

L.C.M. of two = 9 . 16 . 323
G.C.M. of 9 . 16 . 323 and 7344
= 9 . 16 . 17 and the quotients are 19 and 3.
$\therefore$ L.C.M. = 9 . 16 . 17 . 19 . 3
= 139536. Ans.

The following is the most practical method for finding the L.C.M. of several numbers:—

Place the numbers in a line. Divide such as have a common measure by that common measure, placing the quotients and undivided numbers underneath. Proceed in the same way with the second line till the numbers have no common factor. Then multiply the numbers in the last line and all the divisors together. The product will be the L.C.M.

```
17 | 2907 . 5168 . 7344
19 |  171 .  304 .  432
   |    9 .   16 .  432
```

L.C.M. = 17 . 19 . 432 = 139536.

GIRLS ONLY.

(Do three questions only, including the last, if you can.)

1. Simplify the following:
$\frac{4}{15}$ of $1\frac{3}{4} - \frac{7}{11}$ of $3\frac{1}{2}$ of $\frac{8}{49} + \frac{15}{210}$.

2. Find the values of $3\frac{1}{2}$ of $1\frac{7}{11}$ of £1 2s. 6d. + $\frac{2}{5}$ of $1\frac{1}{8}$ of £2 16s. − $\frac{1}{13}$ of $5\frac{1}{2}$ of £1 3s. 2d.; and reduce the result to the fraction of £5 17s.

3. A man bought 120 cows at Rotterdam, paying £9 7s. for each; their carriage to London cost $\frac{1}{15}$ of his outlay; he then exchanged them for 105 ponies, which he sold for £13 10s. per head. What did he gain on his expenditure?

4. *Prove* that $\frac{3}{7}$ of $\frac{4}{9} = \frac{12}{63}$.
Express as decimals $\frac{9}{320}$; $\frac{11}{14}$ of $1\frac{8}{77}$; $3\frac{7}{180}$.

(1) $\frac{4}{15}$ of $1\frac{3}{4} - \frac{7}{11}$ of $3\frac{1}{2}$ of $\frac{8}{49} + \frac{15}{210}$
$= (\frac{4}{15} \times \frac{7}{4}) - (\frac{7}{11} \times \frac{11}{2} \times \frac{8}{49}) + \frac{15}{210}$
$= \frac{1}{2} - \frac{4}{7} + \frac{15}{210}$
$= \frac{42 - 60 + 15}{210}$
$= \frac{40}{210}$
$= \underline{\frac{4}{21}}$ Ans.

(2) $3\frac{1}{2}$ of $1\frac{8}{77}$ of £1 2s. 6d. = $\frac{7}{2} \times \frac{11}{4} \times \frac{5}{8}$ = £4 10 0
$\frac{2}{5}$ of $1\frac{7}{8}$ of £2 16s. = $\frac{2}{5} \times \frac{15}{8} \times$ £2 16s. = 1 17 4
£6 7 4
$\frac{8}{13}$ of $5\frac{1}{2}$ of £1 3s. 2d. = $\frac{8}{13} \times \frac{11}{2} \times$ £1 3s. 2d. = 2 6 4
£4 1 0

$\frac{£4\ 1}{£5\ 17} = \underline{\frac{41}{117}}$ Ans.

(3) £13 10s. × 105 = £1,417 10 0
£9 7s. × 120 = £1,122
$\frac{1}{34}$ of this = 33 1,155 0 0
Gain = £262 10 0

(4) $\frac{3}{7}$ of $\frac{4}{9} = \frac{12}{63}$.
Divide a line into 28 parts. Then $\frac{1}{7}$ of these = 4 parts. $\frac{4}{9}$ of them = 20 parts. $\frac{1}{4}$ of 20 parts = 5 parts. Then $\frac{3}{4}$ = 15 parts. That is, $\frac{4}{9}$ of the whole = 20 parts, and $\frac{3}{7}$ of $\frac{4}{9}$ = 15 of the 28 parts, or $\frac{12}{63}$.

$\frac{9}{320} = \frac{\cdot 9}{32} = \frac{\cdot 225}{8} = \cdot 028125$.

$\frac{11}{14}$ of $1\frac{8}{77} = \frac{11}{14} \times \frac{85}{77} = \frac{5}{7} = \cdot 714285$.

$3\frac{7}{180} = 3\frac{\cdot 7}{18} = 3\frac{\cdot 35}{9} = 3\cdot 038$.

END OF THIRD YEAR.

Euclid.

BOYS ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as +, −, ×.]

(Answer two questions, including Question 3, if you can do so.)

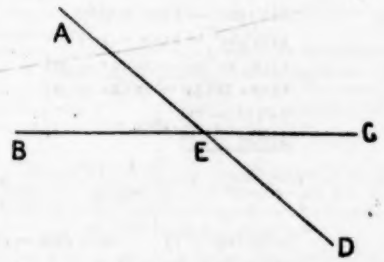
1. If a straight line fall on two parallel straight lines, it makes the alternate angles equal to one another, and the exterior angle equal to the interior and opposite angle on the same side; and also the two interior angles on the same side together equal to two right angles.

Euclid, Book I., Prop. 29.

2. To describe a square on a given straight line.

Euclid, Book I., Prop. 46.

3. Four straight lines meet in a point: show that, if the pairs of opposite angles are equal, the lines form a pair of straight lines.



Let the four straight lines AE, BE, CE, DE meet at the point E, so as to make the opposite ∠'s AEB and CED equal to one another, and likewise the ∠'s AEC and BED equal to one another. Then AE, ED and BE, EC form two straight lines.

∵ ∠AEB = ∠CED, and ∠AEC = ∠BED,
∴ the two ∠'s AEB, AEC = two ∠'s BED, CED. (Ax.)
And all the ∠'s at E = four right ∠'s. (Cor. I., 15.)
∴ ∠'s AEB, AEC = two right ∠'s
and ∠'s BED, CED = two right ∠'s.

Then ∵ at the point E in the straight line AE, two straight lines BE, EC on opposite sides of it make the adjacent ∠'s together equal to two right ∠'s; they are in one and the same straight line. (I. 14.)

∴ BE, EC form one straight line BEC.

In like manner it may be shown that AE, ED form one straight line AED.

Wherefore, if four straight lines, &c. Q.E.D.

Algebra.

BOYS ONLY.

(Answer three questions only, including Question 4, if you can do so.)

1. State the rule for dividing one algebraical expression by another, and give reasons for it. Divide $4x^4y^4 + 1$ by $2x^2y^2 - 2xy + 1$.

2. Reduce $\frac{26x^3y(6x^2 - 13xy + 6y^2)}{39xy^3(6x^2 - 11xy + 3y^2)}$ to lowest terms and add $\frac{a}{a^2 - b^2}$ to $\frac{b}{(a - b)^2}$.

3. Find the square root of—
$$9a^4 - 24a^3b + 46a^2b^2 - 40ab^3 + 25b^4.$$

4. (*a*.) Solve the equation—
$$\frac{5x}{7} - \frac{4x - 3}{5} - \frac{2x + 7}{21} + 1 = 0.$$

(*b*.) A sum of £11 16s. 6d. is made up of 100 coins, which are either florins or half-crowns; how many are there of each?

1. Arrange the divisor and dividend according to the ascending or descending powers of some common letter. Divide the first term of the dividend by the first term of the divisor for the first term of the quotient. Multiply the whole divisor by this term of the quotient, and subtract the product from the dividend. Divide the first term of the remainder by the first term of the divisor for the second term of the quotient; multiply as before, and subtract the product from the first remainder. Repeat this process till there is no remainder or till the divisor will not exactly divide into the remainder, which attach as a fraction to the quotient by the sign of the remainder.

The method of arrangement is adopted for convenience. The dividend is the product of some factor and the divisor. The highest power of a letter in the dividend is the product of the highest power of the same letter in the divisor and the same letter in a quotient to be found. Hence the rule given above.

$$\begin{array}{l|l} 2x^2y^2 - 2xy + 1)4x^4y^4 + 1 & (2x^2y^2 + 2xy + 1 \\ \quad 4x^4y^4 - 4x^3y^3 + 2x^2y^2 & \\ \quad\quad 4x^3y^3 - 2x^2y^2 + 1 & \\ \quad\quad 4x^3y^3 - 4x^2y^2 + 2xy & \\ \quad\quad\quad 2x^2y^2 - 2xy + 1 & \\ \quad\quad\quad 2x^2y^2 - 2xy + 1 & \end{array}$$

(2)
$$\frac{26x^3y(6x^2 - 13xy + 6y^2)}{39xy^3(6x^2 - 11xy + 3y^2)}$$
$$= \frac{13xy \cdot 2x^2(3x - 2y)(2x - 3y)}{13xy \cdot 3y^2(3x - y)(2x - 3y)}$$
$$= \frac{2x^2(3x - 2y)}{3y^2(3x - y)} \text{ Ans.}$$

$$\frac{a}{a^2 - b^2} + \frac{b}{(a - b)^2}$$
$$= \frac{a}{(a + b)(a - b)} + \frac{b}{(a - b)(a - b)}$$
$$= \frac{a(a - b) + b(a + b)}{(a + b)(a - b)(a - b)}$$
$$= \frac{a^2 + b^2}{a^3 - a^2b - ab^2 + b^3} \text{ Ans.}$$

(3)
$$\begin{array}{l} 9a^4 - 24a^3b + 46a^2b^2 - 40ab^3 + 25b^4 (3a^2 - 4ab + 5b^2 \\ 9a^4 \\ 6a^2 - 4ab \;) - 24a^3b + 46a^2b^2 \\ \quad\quad - 24a^3b + 16a^2b^2 \\ 6a^2 - 8ab + 5b^2 \;) \quad 30a^2b^2 - 40ab^3 + 25b^4 \\ \quad\quad\quad\quad 30a^2b^2 - 40ab^3 + 25b^4 \end{array}$$

(4) (*a*) $\frac{5x}{7} - \frac{4x - 3}{5} - \frac{2x + 7}{21} + 1 = 0.$

Multiply by 105.

$75x - 84x + 63 - 10x - 35 + 105 = 0.$

Collecting and Transposing.

$-19x = -133$

$x = 7.$ Ans.

(*b*) Let x = No. of florins

$100 - x =$,, half crowns

$2x + 2\frac{1}{2}(100 - x) = 236\frac{1}{2}$

$4x + 500 - 5x = 473$

$x = 27$ florins.

$100 - 27 = 73$ half crowns.

Mensuration.

BOYS ONLY.

(Answer one question.)

1. The sides of a triangle in yards are 26, 51, 55; what fraction of an acre is its area?

2. Each side of a rhombus is 120 yards, and one of its angles is 60°; find the area in acres to two decimal places.

(1) $26 + 51 + 55 = 132$

$66 \times (66 - 26) \times (66 - 51) \times (66 - 55)$

$= 66 \times 40 \times 15 \times 11$

$= 435600$

$\sqrt{435600} = 660$ yds. Area

$\frac{660}{4840} = \frac{3}{22}$. Ans.

(2) The rhombus is made up of two equilateral triangles.

Area $= \sqrt{180 \times 60 \times 60 \times 60} \times 2$

$= \sqrt{38880000} \times 2$

$= 6235{\cdot}38 \times 2$

$= 12470{\cdot}76$ yds.

$= 12470{\cdot}76 \div 4840$

$= 2{\cdot}57$ acres. Ans.

Arithmetic.

BOYS ONLY.

(Answer three questions only, including the last, if you can.)

1. If £1,000 gain £225 in 5 years, in what time will any sum of money double itself at the same rate of interest?

2. What sum of money, put out at $3\frac{3}{4}$ per cent. per annum simple interest, will produce each quarter of a year £70 6s. 3d.?

3. A clock, which loses 5 minutes in 24 hours, is set right at 12 o'clock at noon on April 1st; what is the *exact* time when this clock points to 12 o'clock at noon on May 1st?

4. Explain clearly the meaning of true discount and banker's discount. Find the difference between the true and banker's discount on £363 17s. 6d., due nine months hence, at $3\frac{1}{2}$ per cent. per annum.

(1)
	£	£	yrs.	yrs.
Principal	1	: 1000	:: 5	: x
Interest 225	:	1		

$$x = \frac{5 \times 1000}{225}$$
$$= 22\frac{2}{9} \text{ yrs. Ans.}$$

(2) Yearly Interest = £70 6s. 3d. × 4 = £281 5s.

Int.	Int.	Princ.	Princ.
£$3\frac{3}{4}$	: £$281\frac{1}{4}$	:: £100	: £x

$x = \frac{100}{1} \times \frac{1125}{4} \times \frac{4}{15}$

$= £7{,}500.$ Ans.

(3) From April 1st at noon to May 1st at noon = 30 days.

While the clock goes 23 hrs. 55 min. the real time has gone 24 hrs.

hrs. min. dys. hrs. dys. hrs. min. sec.

$\therefore$ 23 55 : 30 :: 24 : 30 2 30 $31\frac{103}{161}$.

The real time is P.M. 2 hrs. 30 min. $31\frac{103}{161}$ sec.

(4) A banker charges interest on the *debt* itself.

Real discount is the interest on the *present worth*, that is, on the sum which put out at interest would produce the debt in the given time.

Thus:—A banker would charge interest on £105 (@ £5 5s.) due a year hence at 5 per cent., whereas real discount would amount to only £5, since £100 put out at interest would make £5 in the year, and so would amount to the debt £105 at the end of the year.

Banker's discount:

£ 100 : £$363\frac{7}{8}$ :: £$3\frac{1}{2}$: £x

yr. 1 $\frac{3}{4}$

$x = \frac{1}{100} \times \frac{2911}{8} \times \frac{3}{4} \times \frac{1}{100}$

= £9 1s. $1\frac{1}{4}$d.

True discount:

$\frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$

£$100\frac{1}{2}$: £$363\frac{7}{8}$: £$\frac{1}{4}$: £x

$x = \frac{2}{201} \times \frac{2911}{8} \times \frac{1}{4}$

= £8 17s. 6d.

Diff. = £9 1s. $11\frac{1}{4}$d − £8 17s. 6d.

= 4s. $5\frac{1}{4}$d. Ans.

Arithmetic.

GIRLS ONLY.

(*Answer three questions only, including the last, if you can.*)

1. Reduce $\frac{4}{5}\frac{4}{5}\frac{4}{3}$, $\frac{1}{4}\frac{9}{5}\frac{3}{6}$ to their lowest terms, and then divide their sum by $1\frac{1}{2}\frac{7}{2}$.

2. Simplify $\frac{5{\cdot}5811}{{\cdot}067} - \frac{{\cdot}119}{70}$.

3. If 3 cwt. of metal costs £26 19s., what is the value of a piece weighing 6 cwt. 1 qr. 25 lbs.?

4. Define *Proportion*. Show by examples of numbers greater than 1000 that when four numbers are in proportion, the product of the extremes is equal to the product of the means.

(1) $(\frac{4}{5}\frac{4}{5}\frac{4}{3} + \frac{1}{4}\frac{9}{5}\frac{3}{6}) \div 1\frac{1}{2}\frac{7}{2}$.

$= (\frac{7}{8} + \frac{1}{11}) \div \frac{11}{24}$

$= \frac{21 + 22}{24} \times \frac{24}{11}$

$= \frac{43}{24} \times \frac{24}{11}$

$= \underline{1}$. Ans.

(2) $\frac{5{\cdot}5811}{{\cdot}067} - \frac{{\cdot}119}{70}$

67)5581(83·3 70) 119

536 0017

221

201

201

201

83·3 − ·0017

= 83·2983. Ans.

(3)

cwt.		cwt.	qr.	lbs.		£	s.		£
3	:	6	1	25	::	26	19	:	x
112		4				20			
336		25				539			
		28				725			
		725				2695			
						1078			
						3773	s.		d.

336)3907775(1163 o$\frac{1}{4}$

336

547

336

2117

2016

1015

1008

7

12

84

336 = $\frac{1}{4}$.

= £58 3s. o$\frac{1}{4}$d. Ans.

(4) Proportion is the equality of two ratios; and is such that when the ratio of one number is to a second what the ratio of a third number is to a fourth, the four numbers are said to be in proportion, and the numbers are called proportionals.

Proportion is usually expressed as follows:—4 : 8 :: 16 : 32, which is read, As 4 is to 8 so is 16 to 32.

The first and last numbers are called the extremes; the second and the third are called the means. The product of the extremes = the product of the means.

Example.

1210 : 2420 :: 3630 : 7260.

7260	3630
1210	2420
72600	72600
87120	14520
8784600	7260
	8784600

END OF FOURTH YEAR.

Euclid.

BOYS ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as −, +, ×.]

(*Answer two questions, including Question 3, if you can do so.*)

1. Define *plane angle, figure, semicircle, parallelogram, axiom, theorem, gnomon.*

A *plane angle* is the inclination of two lines to one another in a plane, which meet together, but are not in the same direction.

A *figure* is that which is enclosed by one or more boundaries.

A *semicircle* is the figure contained by a diameter, and the part of the circumference which it cuts off.

A *parallelogram* is a four-sided figure of which the opposite sides are parallel.

An *axiom* is a self-evident truth which the mind accepts without demonstration.

A *theorem* is the statement of a proposition to be demonstrated by a train of reasoning from truths previously demonstrated.

A *gnomon* is a figure made up of any of the parallelograms about the diagonal of the parallelogram, together with the two complements.

2. If a straight line be divided into any two parts, the square on the whole line is equal to the squares on the two parts, together with twice the rectangles contained by these parts.

Euclid, Book II., Prop. 4.

3. If a straight line be divided into any three parts, the square on the whole line is equal to the sum of the squares on the three parts, together with twice the rectangles contained by each pair of these parts.

∵ ∠AEB = ∠CED, and ∠AEC = ∠BED,

∴ the two ∠'s AEB, AEC = two ∠'s BED, CED. (Ax.)

And all the ∠'s at E = four right ∠'s. (Cor. I., 15.)

∴ ∠'s AEB, AEC = two right ∠'s
and ∠'s BED, CED = two right ∠'s.

Then ∵ at the point E in the straight line AE, two straight lines BE, EC on opposite sides of it make the adjacent ∠'s together equal to two right ∠'s; they are in one and the same straight line. (I. 14.)

∴ BE, EC form one straight line BEC.

In like manner it may be shown that AE, ED form one straight line AED.

Wherefore, if four straight lines, &c. Q.E.D.

Algebra.

BOYS ONLY.

(Answer three questions only, including Question 4, if you can do so.)

1. State the rule for dividing one algebraical expression by another, and give reasons for it. Divide $4x^4y^4 + 1$ by $2x^2y^2 - 2xy + 1$.

2. Reduce $\frac{26x^3y(6x^2 - 13xy + 6y^2)}{39xy^3(6x^2 - 11xy + 3y^2)}$ to lowest terms and add $\frac{a}{a^2 - b^2}$ to $\frac{b}{(a - b)^2}$.

3. Find the square root of—
$$9a^4 - 24a^3b + 46a^2b^2 - 40ab^3 + 25b^4.$$

4. (*a*.) Solve the equation—
$$\frac{5x}{7} - \frac{4x - 3}{5} - \frac{2x + 7}{21} + 1 = 0.$$

(*b*.) A sum of £1 16s. 6d. is made up of 100 coins, which are either florins or half-crowns; how many are there of each?

1. Arrange the divisor and dividend according to the ascending or descending powers of some common letter. Divide the first term of the dividend by the first term of the divisor for the first term of the quotient. Multiply the whole divisor by this term of the quotient, and subtract the product from the dividend. Divide the first term of the remainder by the first term of the divisor for the second term of the quotient; multiply as before, and subtract the product from the first remainder. Repeat this process till there is no remainder or till the divisor will not exactly divide into the remainder, which attach as a fraction to the quotient by the sign of the remainder.

The method of arrangement is adopted for convenience. The dividend is the product of some factor and the divisor. The highest power of a letter in the dividend is the product of the highest power of the same letter in the divisor and the same letter in a quotient to be found. Hence the rule given above.

$$\begin{array}{l|l} 2x^2y^2 - 2xy + 1)4x^4y^4 + 1 & (2x^2y^2 + 2xy + 1 \\ \quad 4x^4y^4 - 4x^3y^3 + 2x^2y^2 & \\ \quad\quad 4x^3y^3 - 2x^2y^2 + 1 & \\ \quad\quad 4x^3y^3 - 4x^2y^2 + 2xy & \\ \quad\quad\quad 2x^2y^2 - 2xy + 1 & \\ \quad\quad\quad 2x^2y^2 - 2xy + 1 & \end{array}$$

(2)
$$\frac{26x^3y(6x^2 - 13xy + 6y^2)}{39xy^3(6x^2 - 11xy + 3y^2)}$$
$$= \frac{13xy \cdot 2x^2(3x - 2y)(2x - 3y)}{13xy \cdot 3y^2(3x - y)(2x - 3y)}$$
$$= \frac{2x^2(3x - 2y)}{3y^2(3x - y)} \text{ Ans.}$$

$$\frac{a}{a^2 - b^2} + \frac{b}{(a - b)^2}$$
$$= \frac{a}{(a + b)(a - b)} + \frac{b}{(a - b)(a - b)}$$
$$= \frac{a(a - b) + b(a + b)}{(a + b)(a - b)(a - b)}$$
$$= \frac{a^2 + b^2}{a^3 - a^2b - ab^2 + b^3} \text{ Ans.}$$

(3)
$$\begin{array}{l} 9a^4 - 24a^3b + 46a^2b^2 - 40ab^3 + 25b^4 (3a^2 - 4ab + 5b^2 \\ \underline{9a^4} \\ 6a^2 - 4ab \;) - 24a^3b + 46a^2b^2 \\ \quad\quad\quad\quad\quad\quad \underline{- 24a^3b + 16a^2b^2} \\ 6a^2 - 8ab + 5b^2 \;) \quad\quad 30a^2b^2 - 40ab^3 + 25b^4 \\ \quad\quad\quad\quad\quad\quad\quad\quad \underline{30a^2b^2 - 40ab^3 + 25b^4} \end{array}$$

(4) (*a*) $\frac{5x}{7} - \frac{4x - 3}{5} - \frac{2x + 7}{21} + 1 = 0.$

Multiply by 105.

$$75x - 84x + 63 - 10x - 35 + 105 = 0.$$

Collecting and Transposing.

$$-19x = -133$$
$$x = 7. \text{ Ans.}$$

(*b*) Let x = No. of florins
$100 - x$ = ,, half crowns

$$2x + 2\tfrac{1}{2}(100 - x) = 236\tfrac{1}{2}$$
$$4x + 500 - 5x = 473$$
$$x = 27 \text{ florins.}$$
$$100 - 27 = 73 \text{ half crowns.}$$

Mensuration.

BOYS ONLY.

(Answer one question.)

1. The sides of a triangle in yards are 26, 51, 55; what fraction of an acre is its area?

2. Each side of a rhombus is 120 yards, and one of its angles is 60°; find the area in acres to two decimal places.

(1) $26 + 51 + 55 = 132$

$$66 \times (66 - 26) \times (66 - 51) \times (66 - 55)$$
$$= 66 \times 40 \times 15 \times 11$$
$$= 435600$$
$$\sqrt{435600} = 660 \text{ yds. Area}$$
$$\frac{660}{4840} = \frac{3}{22}. \text{ Ans.}$$

(2) The rhombus is made up of two equilateral triangles.

$$\text{Area} = \sqrt{180 \times 60 \times 60 \times 60} \times 2$$
$$= \sqrt{38880000} \times 2$$
$$= 6235{\cdot}38 \times 2$$
$$= 12470{\cdot}76 \text{ yds.}$$
$$= 12470{\cdot}76 \div 4840$$
$$= 2{\cdot}57 \text{ acres. Ans.}$$

Arithmetic.

BOYS ONLY.

(Answer three questions only, including the last, if you can.)

1. If £1,000 gain £225 in 5 years, in what time will any sum of money double itself at the same rate of interest?

2. What sum of money, put out at $3\frac{3}{4}$ per cent. per annum simple interest, will produce each quarter of a year £70 6s. 3d.?

3. A clock, which loses 5 minutes in 24 hours, is set right at 12 o'clock at noon on April 1st; what is the *exact* time when this clock points to 12 o'clock at noon on May 1st?

4. Explain clearly the meaning of true discount and banker's discount. Find the difference between the true and banker's discount on £363 17s. 6d., due nine months hence, at $3\frac{1}{2}$ per cent. per annum.

(1)
$$\begin{array}{lccccc} & £ & £ & \text{yrs.} & \text{yrs.} \\ \text{Principal} & 1 & : & 1000 & :: & 5 : x \\ \text{Interest } 225 & : & & 1 & & \end{array}$$
$$x = \frac{5 \times 1000}{225}$$
$$= 22\tfrac{2}{9} \text{ yrs. Ans.}$$

(2) Yearly Interest = £70 6s. 3d. × 4 = £281 5s.

$$\begin{array}{cccccc} \text{Int.} & & \text{Int.} & & \text{Princ.} & \text{Princ.} \\ £3\frac{3}{4} & : & £281\frac{1}{4} & :: & £100 & : £x \end{array}$$
$$x = \tfrac{100}{1} \times \tfrac{1125}{4} \times \tfrac{4}{15}$$
$$= £7{,}500. \text{ Ans.}$$

(3) From April 1st at noon to May 1st at noon = 30 days.
While the clock goes 23 hrs. 55 min. the real time has gone 24 hrs.

hrs. min. dys. hrs. dys. hrs. min. sec.
∴ 23 55 : 30 :: 24 : 30 2 30 $31\frac{103}{161}$.

The real time is P.M. 2 hrs. 30 min. $31\frac{103}{161}$ sec.

(4) A banker charges interest on the *debt* itself.
Real discount is the interest on the *present worth*, that is, on the sum which put out at interest would produce the debt in the given time.

Thus:—A banker would charge interest on £105 (@ £5 5s.) due a year hence at 5 per cent., whereas real discount would amount to only £5, since £100 put out at interest would make £5 in the year, and so would amount to the debt £105 at the end of the year.

Banker's discount:

£ 100 : £$363\frac{7}{8}$ :: £$3\frac{1}{8}$: £x
yr. 1 $\frac{3}{4}$
$x = \frac{1}{8} \times \frac{2911}{8} \times \frac{3}{4} \times \frac{1}{100}$
= £9 1s. $11\frac{1}{4}$d.

True discount:

$\frac{3}{4} \times \frac{1}{8} = \frac{3}{32}$
£$100\frac{3}{32}$: £$363\frac{7}{8}$: £$\frac{3}{32}$: £x
$x = \frac{3}{100} \times \frac{2911}{8} \times \frac{3}{32}$
= £8 17s. 6d.
Diff. = £9 1s. $11\frac{1}{4}$d − £8 17s. 6d.
= 4s. $5\frac{1}{4}$d. Ans.

Arithmetic.

GIRLS ONLY.

(*Answer three questions only, including the last, if you can.*)

1. Reduce $\frac{4}{5}\frac{4}{5}\frac{4}{5}$, $\frac{2}{3}\frac{2}{3}\frac{2}{3}$ to their lowest terms, and then divide their sum by $1\frac{1}{4}\frac{1}{4}$.

2. Simplify $\frac{5{\cdot}5811}{{\cdot}067} - \frac{{\cdot}119}{70}$.

3. If 3 cwt. of metal costs £26 19s., what is the value of a piece weighing 6 cwt. 1 qr. 25 lbs.?

4. Define *Proportion*. Show by examples of numbers greater than 1000 that when four numbers are in proportion, the product of the extremes is equal to the product of the means.

(1) $(\frac{4}{5}\frac{4}{5}\frac{4}{5}\frac{4}{5} + \frac{2}{3}\frac{2}{3}\frac{2}{3}\frac{2}{3}) \div 1\frac{1}{4}\frac{1}{4}$.
$= (\frac{4}{5} + \frac{2}{3}) \div \frac{5}{4}$
$= \frac{21 + 22}{24} \times \frac{4}{5}$
$= \frac{43}{24} \times \frac{4}{5}$
$= \underline{1}$. Ans.

(2) $\frac{5{\cdot}5811}{{\cdot}067} - \frac{{\cdot}119}{70}$

·067)5·5811(83·3 70)·119(·0017
536
221
201
201
201

83·3 − ·0017
= 83·2983. Ans.

(3)

cwt.		cwt.	qr.	lbs.		£	s.		£
3	:	6	1	25	::	26	19	:	x
112		4				20			
336		25				539			
		28				725			
		725				2695			
						1078			
						3773	s.		d.
						336)1390775(1163			$0\frac{1}{4}$
						336			
						547			
						336			
						2117			
						2016			
						1015			
						1008			
						7			
						12			
						84			
						336			

= £58 3s. $0\frac{1}{4}$d. Ans.

(4) Proportion is the equality of two ratios; and is such that when the ratio of one number is to a second what the ratio of a third number is to a fourth, the four numbers are said to be in proportion, and the numbers are called proportionals.

Proportion is usually expressed as follows:—4 : 8 :: 16 : 32, which is read, As 4 is to 8 so is 16 to 32.

The first and last numbers are called the extremes; the second and the third are called the means. The product of the extremes = the product of the means.

Example.

1210 : 2420 :: 3630 : 7260.

7260	3630
1210	2420
72600	72600
87120	14520
8784600	7260
	8784600

END OF FOURTH YEAR.

Euclid.

BOYS ONLY.

[All generally understood abbreviations and symbols for *words* may be used, but not symbols of *operation*, such as −, +, ×.]

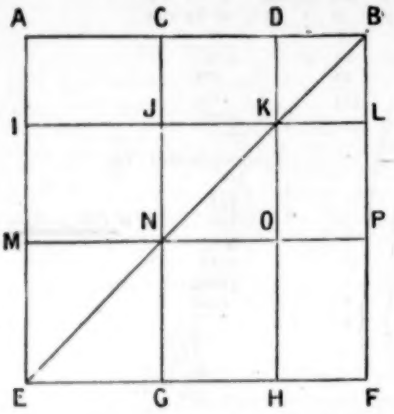
(*Answer two questions, including Question 3, if you can do so.*)

1. Define *plane angle*, *figure*, *semicircle*, *parallelogram*, *axiom*, *theorem*, *gnomon*.

A *plane angle* is the inclination of two lines to one another in a plane, which meet together, but are not in the same direction.
A *figure* is that which is enclosed by one or more boundaries.
A *semicircle* is the figure contained by a diameter, and the part of the circumference which it cuts off.
A *parallelogram* is a four-sided figure of which the opposite sides are parallel.
An *axiom* is a self-evident truth which the mind accepts without demonstration.
A *theorem* is the statement of a proposition to be demonstrated by a train of reasoning from truths previously demonstrated.
A *gnomon* is a figure made up of any of the parallelograms about the diagonal of the parallelogram, together with the two complements.

2. If a straight line be divided into any two parts, the square on the whole line is equal to the squares on the two parts, together with twice the rectangles contained by these parts.
Euclid, Book II., Prop. 4.

3. If a straight line be divided into any three parts, the square on the whole line is equal to the sum of the squares on the three parts, together with twice the rectangles contained by each pair of these parts.



Let AB be the given line, and let it be divided into any three parts as at C and D.

Then the sq. on AB = the sum of sqs. on AC, CD, DB together with twice the rect. AC, CD, twice AC, CB and twice CD, DB.

Upon AB describe the sq. AEFB. Join BE. Through C and D draw CJNG and DKOH parallel to AE or BF. Through K and N draw IJKL and MNOP parallel to AB or EF.

Then (II., 4) DL is the sq. on DB, JO the sq. on CD and MG the sq. on AC. CK, KP are twice the rectangle CK, that is CD, DB; IN and NH are twice the rect. IN, that is AC, CD; and AJ, OF are twice the rect. AJ, that is AC, DB.

But these nine figures make up the whole fig. AF, which is the sq. on AB. Wherefore, if a straight line, &c. Q.E.D.

Algebra.

BOYS ONLY.

(Answer three questions, including Question 4, if you can do so.)

1. Reduce to lowest terms $\frac{2a^3 + a^2 - 8a + 5}{7a^2 - 12a + 5}$.

2. *Prove* that $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$, and simplify $\frac{2a}{4b^2 + a^2} + \frac{1}{2b - a} - \frac{1}{2b + a}$.

3. Solve the equations—

(1) $2\left(\frac{5x}{3} - 1\right) + \frac{11}{5} + \frac{14x}{15} = \frac{2x + 7}{5} - 7.$

(2) $\begin{cases} \frac{x}{5} - \frac{y}{7} = 1. \\ \frac{2x}{3} - \frac{y}{2} = 3. \end{cases}$

4. (*a*) Solve the equation—

$$6x^2 - 44x + 70 = 0.$$

(*b*) Find two numbers which differ by eleven, and such that one-third of the greater exceeds one fourth of the less by seven.

(1) $\frac{2a^3 + a^2 - 8a + 5}{7a^2 - 12a + 5}$

Resolving into factors

$$= \frac{(a - 1)(2a^2 + 3a - 5)}{(a - 1)(7a - 5)}$$

$$= \underline{\frac{2a^2 + 3a - 5}{7a - 5}}. \text{ Ans.}$$

(2) $\frac{a}{b} + \frac{c}{d} = \frac{ab + bc}{bd}$

Multiplying the numerator and denominator of a fraction by the same number does not alter the value of the fraction.

Multiplying $\frac{a}{b}$ by d we have $\frac{ab}{bd}$

Multiplying $\frac{c}{d}$ by b we have $\frac{bc}{bd}$

Hence we have two fractions with the same denominator. The sum of these is

$$\frac{ab + bc}{bd} \quad \therefore \frac{a}{b} + \frac{c}{d} = \frac{ab + bc}{bd}$$

$$\frac{2a}{4b^2 + a^2} + \frac{1}{2b - a} - \frac{1}{2b + a}$$

$$= \frac{2a}{4b^2 + a^2} + \frac{(2b + a) - (2b - a)}{4b^2 - a^2}$$

$$= \frac{2a}{4b^2 + a^2} + \frac{2a}{4b^2 - a^2}$$

$$= \frac{2a(4b^2 - a^2) + 2a(4b^2 + a^2)}{16b^4 - a^4}$$

$$= \underline{\frac{16ab^2}{16b^4 - a^4}} \text{ Ans.}$$

(3) (1) $2\left(\frac{5x}{3} - 1\right) + \frac{11}{5} + \frac{14x}{15} = \frac{2x + 7}{5} - 7.$

Multiply by 15.

$$50x - 30 + 33 + 14x = 6x + 21 - 105$$

$$58x = -87$$

$$x = -\frac{87}{58} \text{ or } -\frac{3}{2} \text{ or } -1\frac{1}{2}.$$

(2)
$$\frac{x}{5} - \frac{y}{7} = 1$$
$$\frac{2x}{3} - \frac{y}{2} = 3$$
$$7x - 5y = 35$$
$$4x - 3y = 18$$
$$21x - 15y = 105$$
$$20x - 15y = 90$$
$$x = \underline{15}$$
$$60 - 3y = 18$$
$$-3y = -42$$
$$y = \underline{14}.$$

(4) (*a*) $6x^2 - 44x + 70 = 0$

$$x^2 - \tfrac{22}{3}x + (\tfrac{11}{6})^2 = -\tfrac{35}{3} + (\tfrac{11}{6})^2 \text{ or } \tfrac{169}{36}$$

$$x - \tfrac{11}{6} = \pm \tfrac{13}{6}$$

$$x = \pm \tfrac{13}{6} + \tfrac{11}{6} = \underline{5}, \text{ or } \underline{\tfrac{1}{3}}. \text{ Ans.}$$

(*b*) Let x = less No.

$x + 11$ = greater.

$$\frac{x + 11}{3} - \frac{x}{4} = 7$$

$$4x + 44 - 3x = 84$$

$$x = \underline{40} \text{ the less No.}$$

$$40 + 11 = \underline{51} \text{ the greater No.} \quad \Big\} \text{Ans.}$$

Mensuration.

BOYS ONLY.

(Answer one question only.)

1. The rent of a field in the form of a trapezium is £15 12s., at £1 12s. per acre, and the sum of the perpendiculars upon a diagonal from the opposite angles is 429 feet; find that diagonal.

2. The diameter of a semicircle is 74, and the length of a line drawn to the circumference from the diameter and perpendicular to it is 12; find the ratio of the parts into which the diameter is divided.

(1) Area of field in acres $= \frac{£15\ 12s.}{£1\ 12s.}$

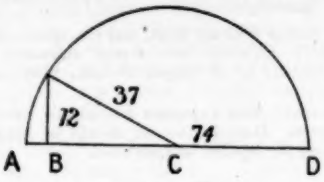
$$= 9\tfrac{3}{4}$$

or 47,190 sq. yds.

Diag. $= \frac{\text{Area}}{\frac{1}{2} \text{ sum of pers.}}$

$$= \frac{47190}{\frac{1}{2} \text{ of } 429} = \frac{47190}{214{\cdot}5} = \underline{220 \text{ yds.}}$$

(2)



$BC = \sqrt{37^2 - 12^2}$
$= \sqrt{1369 - 144}$
$= \sqrt{1225}$
$= 35$

$BD = 37 + 35 = 72$
$AB = 74 - 72 = 2$
$\therefore$ AB : BD
As 2 : 72
or 1 : 36. Ans.

Arithmetic.

BOYS ONLY.

(Answer three questions only, including the last, if you can.)

1. If I invest £7,486 in the 3 per cents. at 98½, sell out ¼ of my stock at 99¼, £700 stock at 93¾, and the remainder at par; how much do I gain or lose? (Neglect brokerage.)

2. A tradesman pays 10 per cent. more for the goods he sells than the cost of manufacture; at what profit per cent. must he sell them that the selling price may be double the cost of manufacture?

3. In what time will the interest amount to $\frac{7}{8}$ of the principal at 4 per cent. per annum simple interest?

4. Describe fully how to extract the cube root of any number. Find the cube root of ·028934443.

(1) Stock bought Stock Stock
£98½ : £7486 :: £100 : £7600

Proceeds of Sales.

	Stock	Stock	Cash	Cash
First	£100	£1900 :: £99¼	:	£1885¾
Second	£100	£700 :: £93¾	:	£656¼
Third	£100	£5000 :: £100	:	£5000

Total proceeds of sale = £7542
Subtract cost of stock = £7486
Gain £ 56 Ans.

(2) Suppose cost of manufacture is £100.
Then cost price = £100 + £10 = £110.
Double cost of manuf. = £200.
His gain if selling price is £200 is £200 − £110 = £90.
Therefore his profit per cent. will be
£110 : £100 :: £90 : £81$\frac{9}{11}$. Ans.

(3) £1 gains £$\frac{1}{25}$ in a year at 4 per cent. Time to gain £$\frac{7}{8}$ =
Yr. Yr.
$\frac{1}{25} : \frac{7}{8} :: 1 : x$
$= \frac{25 \times 7}{8}$
$= 21\frac{7}{8}$. Ans.

4. Divide the number into periods of three figures, beginning at the units' place. Find the number whose cube is next below that of the number in the first period and subtract the cube. Bring down the next period. For a trial divisor square the figure already found and multiply by 300. Add to this the root already found × 30 and the next figure of the root; also the sq. of the second figure of the root. Multiply the whole by the second figure of the root, and subtract the product from the figures in the dividend. Repeat this process till all the periods are brought down. If there are decimals in the number proceed as in integers, beginning to point from the units' place, and adding 0's, if necessary, to make up the periods.

·028934443(·307. Ans.

$3^3 = 27$

$3^2 \times 300 = 2700$	1934443
$30^2 \times 300 = 270000$	
$30 \times 30 \times 7 = 6300$	
$7^2 = 49$	
276349	1934443

Arithmetic.

GIRLS ONLY.

(Answer three questions only, including the last, if you can.)

1. Find the discount on £657 6s. 10d., due a quarter of a year hence, at 4 per cent. per annum.

2. Three men rent some land, of which the first has ·25 and the second ·2$\frac{5}{7}$ of the land, and the third has the remaining 1,970 acres. Find the average number of acres rented by each.

3. 1,200 oranges were bought at 3 for 2d. ? 100 were unsaleable, but the rest were sold at 10 for a shilling. What was the gain per cent. ?

4. Explain the rule for finding simple interest. With the amount of £1,200 put out at simple interest for 4 years at 3 per cent. per annum, how much 4 per cent. stock at 120 can I buy?

(1) $\frac{1}{4}$ of £4 = £1

£ £ s. d. £ £ s. d.
101 : 657 6 10 :: 1 : 6 10 2

101)657 6 10(6
606
51
20
101)1026(10
101
16
12
101)202(2
202

(2) $1 - (·25 + ·2\frac{5}{7})$
$= \frac{3}{4} - \frac{3}{99}$
$= \frac{297 - 100}{396}$
$= \frac{197}{396}$ the frac. belonging to the third.
acres acres
$\therefore \frac{197}{396} : \frac{1}{4} :: 1970 : 3960$, the whole field.
The first has ¼ or ·990 acres
,, sec. ,, $\frac{99}{396}$ or 1000
,, third ,, 1970
3960
The average of the three is 1320

(3) $\text{Cost} = \frac{1200 \times 2}{3} = 800\text{d.}$

$\text{Selling price} = \frac{1100 \times 12}{10} = 1320\text{d.}$

Gain = 520.
$\therefore$ 800 : 100 :: 520 : 65. Ans.

(4) For every £100 a certain sum called the rate per cent. is received every year. This sum will be received as many times as the £100 is contained in the principal. Hence the rule: Divide by 100 and multiply by the rate per cent.

If the interest be for a number of years, the amount received will be the sum for one year multiplied by the number of years.

Interest on £1200 $= \frac{1200 \times 4 \times 3}{100}$ = £144.

Amount = £1200 + £144 = £1344.

Stock to be bought
stock stock
= £120 : £1340 :: £100 : £1116⅔. Ans.

Needlework.

GIRLS ONLY.

(One hour allowed for this exercise.)

END OF FIRST YEAR.

Make a wristband (closed or open) for a boy's nightshirt.

END OF SECOND YEAR.

On a piece of calico 9 inches in length fix a hem and three tucks. Shew at least 6 inches of hemming, and run half of each tuck.

END OF THIRD YEAR.

Darn a hole on stocking web material (common method).

On a band of calico, work two different kinds of buttonholes.

END OF FOURTH YEAR.

Make and set on to a stitched band of calico, a muslin frill, showing how you would turn a corner.

All Years.

BOYS AND GIRLS.

Penmanship.

Write in large hand the word *Manufacture*, and in small hand *The Chieftain reared his form on high.*

END OF FIRST YEAR.

Grammar.

(*Answer questions* 1 *and* 2, *and one other question.*)

1. Analyse the following sentences :—

Now, over *Border*, dale, and fell,
Full wide and far was terror *shed;*
For pathless marsh and *mountain cell*
The peasant left his lowly shed.

2. Parse the words in italics in the passage given above.

3. Explain the terms 'subordinate adverbial sentences,' 'prepositional phrases,' and 'indefinite numeral adjectives;' give three examples of each.

4. Form abstract nouns from the following adjectives, and give the meaning of the termination in each case :—

Free, brave, absolute, pretty, loyal, legal.

5. How are verbs inflected? Explain the terms 'infinitive' and 'subjunctive moods;' and give three sentences each containing a verb in the subjunctive mood.

(1) (*a*) Subject : Terror
Pred. : was shed
Ex. of Pred.: now (time), over Border, dale and fell (place), full wide and far (manner).
(*b*) Subject : The peasant
Pred. : left
Object : his lowly shed
Ind. Obj. : for pathless marsh and mountain cell.

(2) *Border*—Prop. noun, neut., sing., 3rd., obj. case gov. by *over*.
full—adverb of deg., modifying *wide*.
wide—adverb of manner, modifying *was shed*.
shed—past part. of the verb *to shed*, refg. to *terror*, and forming with *was*, the past tense, indic. pass. voice of *to shed*, and agreeing with its nom. *terror*.
mountain—com. noun used as an adj. of qual., qualg. *cell*.
cell—com. noun, neut., sing., 3rd, obj. case, gov. by *for*.

(3) *Subordinate adverbial sentences* are sentences which cannot stand by themselves but which are used to qualify like an adverb the statement contained in the principal sentence, as—

I found the box *where you left it.*
He goes *whenever you tell him.*
The tiger sleeps *while the sun is shining brightly.*

Prepositional phrases are prepositions with the nouns which they govern in the objective case, as—

Birds *of a feather* flock together.
Come *into the garden*, Maud.
Under a spreading chestnut tree, the village smithy stands.

Sometimes two or more prepositions used as one preposition are called prepositional phrases, as—according to, instead of, from above.

Indefinite numeral adjectives are adjectives which denote number without specifying how many, as—*Some* men, *many* children, *few* books.

(4)

Adjective.	Derivative.	Affix and meaning.
(1) Free	freedom	*dom*, state or condition.
(2) Brave	bravery	*ry*, "
(3) Absolute	absolutism	*ism*, forming abstract noun and meaning state or condition.
(4) Pretty	prettiness	*ness*, state or condition.
(5) Loyal	loyalty	*ty*, as 3.
(6) Legal	legality	*ity*, as 3.

(5) Verbs are inflected to denote voice, mood, tense, number, and person.

Infinitive means without limit, and the mood of the verb is so called which expresses the action unlimited as regards person or number, as—It began *to rain.* He came *to stay.* I love *to read.*

The *subjunctive mood* expresses a condition, as—*If he come*, I shall go away. *Were he here*, we should be happy. *If thou hadst been here*, my brother had not died.

Geography.

BOYS AND GIRLS.

(*Answer three questions only.*)

1. Which are the most mountainous parts of this island? Show by example how the elevation of the land affects the length and direction of the rivers in England or Scotland.

2. Name the provinces which unite to form the Dominion of Canada, and give also the principal towns, and chief industry of each.

3. Where are Londonderry, Killarney, Winnipeg, Grafton, Auckland, Lanark, The Trosachs, The Peak, The Fens, The Downs, and the Black Country? Give one or two leading facts about each.

4. Draw a map of *one* of these :—
(*a*) The six northern counties of England ; *or*
(*b*) New Zealand ; *or*
(*c*) Ireland ;
and insert in it the positions of three rivers and six towns.

5. In what parts of England are leather, iron, and woollen goods severally manufactured? Name three towns engaged in each of these industries.

(1) The most mountainous parts of Great Britain are Cornwall, Wales, the north-east of England, and the whole of the west and north-west of Scotland. The high land in England lies nearer the west than the east coast. The general direction of the ranges is from north to south, and the slopes are longer on the east than on the west side. Hence the rivers are longer on the east than the west. Most of the mountain ranges have spurs of greater or less elevation stretching eastward. These give a generally easterly direction to the rivers.

The Tyne, Wear, Tees, Yorkshire Ouse, and Thames all flow almost directly eastward. The Trent and Great Ouse flow in a more north-easterly direction.

The same holds good in Scotland. The Tweed, Forth, Tay, Dee and Don are easterly streams, the mountains being nearer the east than west, and the basins of the rivers are enclosed by high lands which come almost at right angles from the main chain. The rivers on the western slope are shorter, and flow in a westerly direction. The Severn and the Clyde are more or less exceptions to the rule.

(2)

PROVINCES.	CHIEF TOWNS.	INDUSTRY.
Quebec ...	Quebec, Montreal, Three Rivers ...	Agriculture, lumbering.
Ontario ...	Ottawa, Kingston, Hamilton, London, Toronto ...	Lumbering, agriculture, coal mining.
Manitoba ...	Winnipeg, Fort Garry, Selkirk ...	Agriculture, growth of wheat, lumbering.
Nova Scotia ...	Halifax	Fisheries, coal-mining, lumbering.
NewBrunswick	Frederickton, St. John, Newcastle	Fisheries, ship building, lumbering.
Prince Edward's Island	Charlotte Town ...	Agriculture and fisheries.
British Columbia and Vancouver Island	New Westminster, Victoria	Gold and coal-mining, fishery, agriculture.

(3) *Londonderry*, city on the Foyle, in the north of Ireland, siege in 1689, of great antiquity, linen manufacture.

Killarney, a series of three lakes renowned for their grandeur and beauty, situated in the Macgillicuddy's Reeks in County Kerry; much visited by tourists; many islands in the lakes.

Winnipeg, capital of Manitoba, Dominion of Canada, where Red River and Assiniboine unite. Chief exports, corn and timber.

Grafton, a city of New South Wales, Australia, exports sugar, gold, molasses, tallow, &c.

Auckland, chief city of the district of same name in North Island, New Zealand, on Waitewata Harbour, a part of the Thames Gulf.

Lanark, capital of county Lanark, Scotland, on the Clyde, noted for iron works, Falls of Clyde in the neighbourhood.

The Trosachs, a narrow, well-wooded defile at the eastern end of Loch Katrine, much visited by tourists.

The Peak, the highest point in the southern extremity of the Pennine Chain in Derbyshire.

The Fens, the district round about the Wash, low and flat, numerous canals for drainage, often under water, frequented by various waterfowl.

The Downs, two ranges of chalk hills south of the Thames, one terminating at Dover, the other at Beachy Head.

The Black Country, the district of South Staffordshire between Wolverhampton on the north and Birmingham on the south, including Wednesbury, West Bromwich, Oldbury, Tipton, Darlaston, Dudley, Bilston, Willenhall, and other towns engaged in the iron and steel trade.

(5) *Leather*. Staffordshire, Leicestershire, and Northamptonshire; Leicester, Stafford, Northampton. Tanning is carried on at Bermondsey.

Iron, smelted in South Wales, South Staffordshire, and Cleveland. Manufactured in Sheffield and Rotherham, Birmingham and district, and Middlesborough.

Woollen, in West Riding of Yorkshire, and in West of England. Leeds, Bradford, Halifax, Huddersfield in Yorkshire. Trowbridge, Bradford, Frome, Stroud, in Gloucester, Wilts and Somerset.

History.

BOYS AND GIRLS.

(*Answer two questions only.*)

1. Name the three English kings before the Conquest whom you think the greatest, and give reasons for your selection.

2. State briefly, with dates, what you know of the following: Hengist, Augustine, Offa, Godwin, and Edgar the Atheling.

3. Write a short account of the reign of Canute.

4. Who were the Normans? What intercourse had taken place between England and Normandy before the Conquest?

5. Relate the story of Harold's oath.

(1) Egbert, Alfred, Athelstan.

Egbert proved himself courageous, strong-willed, active and decisive. He practically ruled England, as Wessex and Mercia were completely under his sway. He had to meet the Danes, and was no mean opponent to them.

Alfred from his achievements was styled 'the Great.' He overcame the Danes, built schools, founded a navy, promoted trade, appointed upright judges, and tried to be always prepared to meet his enemies.

Athelstan was an active and successful monarch, and was actually the first king of all England. He annexed Northumbria on the death of its king, and defeated a large army of Scots and Northmen at Brunanburh (937). He was a worthy successor of Alfred.

(2) *Hengist*, a chief of the Jutes, who was hired by Vortigern, a British chief, to drive back the Picts and Scots (449). Received the Isle of Thanet as a reward for his services, but quarrelled with the king, and took possession of Kent, and founded the kingdom of the same name (457).

Augustine, sent by Pope Gregory to preach in Brirain (597). Made Archbishop of Canterbury, ordained Bishops of London and Rochester, tried to secure the power of Roman Pontiff in Britain.

Offa, called 'The Terrible,' king of Mercia, conquered the Welsh, built Offa's Dyke, subdued a great part of Wessex; a man of refinement, as shown by his coins, medals, and palaces (757—796).

Godwin, English earl of Wessex; supported by king Canute, whose relative he married. Supported Hardicanute against Harold, the illegitimate son of Canute; said to have betrayed Alfred Atheling to Harold. Chief adviser to Edward the Confessor, compelled to leave England (1051), returned next year, but died soon after.

Edgar Atheling, grandson of Edmund Ironside, elected to the throne on the death of Harold, but being unsupported, was eventually passed over for William. Joined rebellion against William in 1069. Was taken prisoner by William Rufus at the siege of Tinchebrai; released and pensioned by Henry I.; Malcolm Canmore afterwards invaded England on his behalf.

(3) Canute, on the death of his father Sweyn, was proclaimed king of England, but this claim was disputed by Ethelred who had been recalled and by his son Edmund Ironside. Six pitched battles were fought between Canute and the latter, but at last they agreed to share the kingdom, Canute taking all north of the Thames except East Anglia and Essex. In 1016 Canute became sole king. He divided England into four earldoms: Wessex, Mercia, East Anglia and Northumbria. Canute ruled England wisely, and his reported reproof to his courtiers shows him to have been above flattery. The latter part of his reign was peaceful, and he paid a visit to Rome. He had married Emma, the widow of king Ethelred, by whom he had a son, Hardicanute. He died at Shaftesbury in 1035.

(4) The Normans were of Teutonic origin and came from Scandinavia. They were very fond of the sea, and were known as vikings. The greater part of the coasts of the North Sea were conquered or occupied by these sea-kings.

Ethelred the Unready engaged in hostilities with Richard II. Duke of Normandy. The quarrel was made up, and he married Emma, the duke's sister (1002). Normans came over to England to seek places and honours. Ethelred treated his wife badly and a fresh quarrel ensued. The English in Normandy were either killed or imprisoned. Afterwards Ethelred found an asylum in France, and his sons remained there after his death. Thence they came to England to wrest the crown from Harold. Alfred was murdered but Edward returned to Normandy and lived there till the death of Hardicanute called him to the English throne. He filled many posts of honour with Normans; the duke of Normandy visited England, and it is said received a promise of the kingdom from Edward the Confessor. The intercourse between the English and Normans continued to increase till the Conquest.

(5) Harold was wrecked near the mouth of the Somme, and through William's influence and money was released from the captivity into which he had fallen. While with William at Rouen he was told of the promise of Edward the Confessor and asked if he would help William to the throne. He gave his promise, but the duke was not satisfied with this, he asked for one of Harold's companions as a hostage, and Harold being in William's power could not refuse. Still the duke wanted further assurance of Harold's faith. He therefore collected the bones of all the Saints he possibly could, and, covering them with a rich cloth of gold, asked Harold to swear on a missal placed on the cloth, what he had promised. Taken by surprise, he did so, and immediately afterwards the cloth was removed and he found to his horror the trick played upon him.

END OF SECOND YEAR.

English Grammar and Composition.

BOYS AND GIRLS.

(*Answer questions* 1 *and* 2, *and one other question.*)

1. Analyse the following passage:—

Friends we *still* might seem to be,
If my wrong *could* e'er forget
Our hands have met but *not* our hearts;
I *would* our hands had never met.

Parse the words in italics in the passage given above.

2. Paraphrase the following passage:—

Breathes there the man with soul so dead,
Who never to himself hath said,
This is my own, my native land!
Whose heart within him ne'er has burned,
As home his footsteps he hath turned
From wandering on a foreign strand?
If such there breathe, go, mark him well,
For him no minstrel raptures swell.

3. What is the meaning of sub-, pre-, and re-, used as prefixes? Give three examples of each, and show the meaning of each part of the compounds you give.

4. Show the full meaning of the prefix and termination in the following words:—Congregation. Opponent. Difference. Attribute.

5. Explain with three examples the terms subjunctive mood, participial phrase, compound relative pronoun.

(1) *a* Sub. : We
Pred. : might seem to be friends
Ext. of pred. : still
Princ. sent.
b Connective : If
Subj. : my wrong
Pred. : could forget
Ext. of pred. : e'er (time).
Adv. sent. of condition to *a*.
c Subj. : Our hands
Pred. : have met
Noun sent. object to *could forget* in *b*
d Conn. : but
Subj. : our hearts
Pred. : [have met]
Ext. of pred. : not
Noun sent. adversative to *c*.
e Subj. : I
Pred. : would
Princ. sent.
f Subj. : Our hands
Pred. : had met
Ext. of pred. : never (time)
Noun sent., object to *would* in *e*.

Friends—com. noun, plur., 3rd nom. after *to be*.
still—adv. (time), qualifying *might seem to be*.
could—aux. to *forget*, indicating pot. mood, past.
Grammarians who do not use the pot. mood would parse it thus:—
Irr. int. verb, act., ind., past, 3rd sing., agreeing with *I*.
not—adv. of negation, qualifying *have met*.
would = *wish*—irreg. trans. verb, act., ind., past form used for present, 1st sing., agreeing with its. nom. *I*.

(2) Is it possible that there is a man living whose affections are so dead that he has never inwardly spoken of his country as his own native land; who, after wandering in distant lands has not felt his heart leaping with joy as he turned to go home? If there is one such, you should mark him well, for no minstrel will ever rejoice or burst into song on his account.

(3) *Sub*, under, as subscribe (scribo, I write), to write under; subject (jacio, I throw), to put under; subtract (traho, I draw), to draw from under.

Pre, before, as prescribe (scribo), to write beforehand; prepare (paro, I get ready), to get ready beforehand; predict (dico, I say), to tell beforehand.

Re, back or again, as return, to turn back; replace, to place again; retreat (traho, I draw), to draw or go back.

(4)

Word.	Prefix and Meaning.	Termination and Meaning.
Congregation	Con, together	tion, state of.
Opponent	Op, in the way of	ent, agent or doer.
Difference	Dif, apart, away	ence, forming abst. noun.
Attribute	At, to	ute, thing given.

(5) Subjunctive Mood—that form of the verb which expresses an event conditionally, or as a supposition, as—If he *were* away I should be happy; Would that he were our friend; Unless he return soon, I shall go away.

Participial phrase—a number of connected words consisting of a participle and the words depending on it, as—*Furnished with this weapon*, he attacked the animal; *Having been struck by lightning* the house fell down; *Standing by the door*, I saw him pass.

Compound relative pronoun—a relative pronoun which includes both antecedent and relative, as—I asked *what* he wanted; I shall give *whatever* I think proper; I love *what* you hate.

(To be continued.)

How my School was Examined.

BY THE

HEAD MASTER OF A TOWN SCHOOL.

STANDARD I.

Arithmetic.—The following set of sums was dictated:—

1. From 770 take 77.
2. Take 106 from 601.
3. Add together 396; 27; 8; 46; 269.

Answers.—(1) 693; (2) 495; (3) 746.

Writing.—The following words were dictated:—*Morning, Night, Fire, Boat, Sheep, Road, Street, Window, Glass, Garden.*

Geography.—Questions asked on plan of the school.
What is a plan?
In what direction is the playground?
What street is north of the school?
Where do you see the sun on leaving school at noon? How can you find the other points from knowing the east?
Of what use is the mariner's compass?
What does a vane on a steeple tell us?
In what direction is the length of the school?
If a room has a fireplace in the middle of the north side, which side of the room faces the fire?
What is the point between north and west called?
What point is exactly opposite the north-west?

Mental Arithmetic.—1. If three sixes be added together, what will be the answer?

2. If three sixes be placed in a row what number will they stand for?
3. Add four threes to five twos.
4. How many must I add to 16 to make 20?
5. Take 5 from 17, 5 from 12, 5 from 7.
6. How many farthings in 9 halfpennies?

STANDARD II.

Arithmetic.—Two sets of sums.

A. (1) 28,013 − 6,015.
(2) 397 × 409.
(3) 6,294 × 56.
(4) 83,746 ÷ 8.

B. (1) 81,046 − 10,987.
(2) 5,986 × 709.
(3) 48,937 × 74.
(4) 78,469 ÷ 7.

Answers.—*A.* (1) 21,998; (2) 162,373; (3) 352,464; (4) 10,468 + 2 over.

B. (1) 70,059; (2) 4,244,074; (3) 3,621,338; (4) 11,209 + 6 over.

Writing.—A passage dictated from Longmans' New Reader, page 106:

'The man must be very quick and strong to do this, for as long as the seal is in the water, it is very powerful. After being struck with the spear, a seal often struggles so much that the man, who has the rope round his waist, is sometimes thrown down with great force.'

Grammar.—Select nouns and verbs from sentences read. Why is 'book' a noun? What is the meaning of 'Noun?' What is the use of a Verb? Supply a verb to the noun 'Fire.' Supply a noun before the verb 'falls.'

Geography.—Map of England before class. What is an island? Point to one on the map. What are these crooked, winding lines for? What is a river? Where do most rivers begin? What is the beginning called? Where do rivers go to? What is the end of a river called? What is an estuary? Point to one. What is a delta? What is a mountain? How are mountains shown on the map? What is the difference between a mountain chain and a mountain group? What is a volcano? What is a valley? What name is given to a very narrow valley? What is the coast? Point to a coast. What may the coast consist of? (rocks, sands.)

Mental Arithmetic.—Specimen questions.

1. How many pence in 3s. 6d.? in 4s. 7d.? in 8s. 3d.?
2. Add 9 times 3 to 5 times 7.
3. How many nines in 72? sevens in 84?
4. Take 45 pence from 5 shillings.
5. How much would 6 pounds of sugar cost at 2½d. per lb.?
6. How many pence in half-a-crown? in 3 florins?

STANDARD III.

Arithmetic.—Specimen sets of sums.

A. (1) Multiply 25,145 by 609.

(2) From sixty thousand and nine pounds and ten pence take fifty thousand and ninety pounds nineteen shillings and ten pence halfpenny.

(3) What do the following amount to: £79,438 15s. 6¾d., £97,749 16s. 8¼d., £365 10s. 7¾d., £65 2s. 7½d., and £5,848 19s. 11¼d.?

(4) A boy had 16s. 6½d. Another had 2s. 6d. less. What had they between them?

B. (1) Multiply 37,586 by 607.

(2) Take two hundred and one pounds and a farthing from fifteen thousand pounds.

(3) Add together £6 8s. 7½d, £8 16s. od., £700,309 18s. 10¼d., £905 13s. 7½d., £360,852 12s. 9¼d., and £88 18s. 8d.

(4) A man paid 4s. 6½d. for tea, 4s. 3½d. for sugar, 4s. 9½d. for bread. When he came back he had 2s. 6d. in his purse. What had he at first?

Answers.—*A.* (1) 15,313,305. (2) £9,918 os. 11½d. (3) £183,468 5s. 5½d. (4) £1 10s. 7d.

B. (1) 22,814,702. (2) £14,798 19s. 11¾d. (3) £1,062,172 8s. 6½d. (4) 16s. 1½d.

Writing.—Passage dictated from Longmans' New Reader, page 82:—

'Sailors are forced to keep a sharp look-out for icebergs, so as to be able to steer the ship out of their way.

'It would even be dangerous to row up to one in a small boat, because pieces of ice as large as a house sometimes break off from the top of an iceberg and fall into the sea with a crash like thunder.'

Grammar.—Children were asked to select parts of speech from lines chosen from the piece recited, and such questions as follow were given:—

'Our bugles sang truce, for the night cloud had lowered.'

What is *our*? What is a pronoun? For what noun does *our* stand?

What is the word *bugles*? What is the use of the letter *s* at the end of it?

What is the word *sang*? What other verbs are in the line?

Give other nouns from the same line.

Geography.—Questions asked on physical features of England, and on industrial centres.

What part of the country is most mountainous?

What is the principal watershed of England?

What rivers flow east from the Pennine Chain?

What is the main difference between the rivers flowing east and those flowing west?

Why are those flowing east longer and slower?

Name the chief tributaries of the Ouse in Yorkshire.

What industry is carried on in the basin of the Yorkshire Ouse?

Why should the West Riding of Yorkshire be a manufacturing district?

Name the chief towns engaged in making woollen cloth.

What towns in Yorkshire are noted for metal work?

Mental Arithmetic.—Sample questions:—

If a man earns 3s. 9d. a day, what will he earn in a week of six days? How much is this less than 30 shillings?

Take half-a-crown and a florin from half-a-sovereign.

How many farthings in a shilling? in 2s. 6d.? in half-a-guinea?

How many ounces in a pound? how many hundredweights in a ton? how many feet in a yard? Reduce 1s. 7½d. to farthings.

STANDARD IV.

Arithmetic.—Specimen cards:—

A. (1) £67 13s. 7¼d. × 395.

(2) Divide seventy thousand and seven pounds by 87.

(3) How many acres, etc., in 80,706 square feet?

(4) A bag contains £37 8s. 3d. How many heaps can be made up, if each heap contains half-a-crown, a florin, a shilling, a sixpence, and a penny?

B. (1) £999 19s. 11¾d. × 99.

(2) Reduce 27 qrs. 3 pks. 2 qts. to pints.

(3) How many square inches in 1½ acres?

(4) A butcher buys a score of sheep and 5 cows for £149 10s. Each sheep cost 10s. Find the cost of each cow.

Answers.—*A.* (1) £26,733 13s. 7¾d. (2) £804 13s. 6¾d. + 3. (3) 1 ac. 3 rds. 16 pls. 13 sq. yds. 3 sq. ft. (4) 123 heaps.

B. (1) £98,999 17s. 11¼d. (2) 13,876 pts. (3) 9,408,960 sq. inches. (4) £27 18s.

Writing. — Passage dictated from New Royal Reader, No. IV., page 178.

'Good manners are before a handsome face—the one is lasting, while the other is often evanescent. People may become tired of a handsome face, but good manners never tire. Good manners are a passport in society, and usually determine a man's success in life. A good man often injures himself by his bad manners. "Good manners," says Locke, "are the blossom of good sense and good feeling."'

Grammar.—Two lines taken from the passage for recitation were parsed orally:—

'Burned Marmion's swarthy cheek like fire,
And shook his very frame for ire.'

Questions were asked on the relation of the words, and sentences required with some of the same words used in different ways, as *like, very, frame.*

Why are *burned* and *shook* intransitive?

Give sentences in which they are transitive.

Geography. — Questions asked on the physical features of Ireland and Canada.

Name the lakes of Ireland. Which is the largest?

Trace the course of the Shannon.

What is the nature of an Irish bog?

Compare the east and west coasts.

What is the river St. Lawrence remarkable for?

Name the great lakes in its basin.

Where are the Niagara Falls?

What sort of country is Labrador?

What productions are exported from Canada?

Name the most important towns, and say where they are situated?

Mental Arithmetic. — What is the third of a sovereign? the sixth? the eighth?

How much is a half and a quarter?

How many eighths make a half of anything?

Find the cost of 28 books at 10/- each.

Which is the easiest way of finding this?

If I buy 3 lbs. for half a crown, what should I give for 7 lbs?

STANDARD V.

Arithmetic.—Specimen sets of sums:—

A. (1) Find the sum gained by selling 1,050 articles at £9 10s. 9d. each, which cost £8 3s. 7½d. each?

(2) Make a bill for the following: 37 shrubs at 3s. 9d. each, 47 geraniums at 8¾d. each, 25 packets of seeds at 6½d. each, 17 loads of soil at 3/7 per load, turfing half an acre at £7 per rood.

(3) $\frac{5}{7} + \frac{2}{3} - \frac{3}{8} + \frac{3}{8} + \frac{3}{10}$.

(4) A railway 23 miles long cost £22,448. How much would it cost if it were 7 miles longer?

B. (1) If 672 eggs be packed in 7 boxes, how many would there be in 13 such boxes?

(2) Find the value of 7,315 watches at £19 19s. 3d. each.

(3) $\frac{7}{8} - \frac{1}{2} + \frac{3}{4} - \frac{1}{5}$.

(4) Make a bill for—37 pairs of soles, at 8d. per pair; 9¼ lbs. salmon, at 1s. 2d. per lb.; 1 barrel of oysters, 6 doz., at 2s. 10d. per dozen; 3 turkeys, each weighing 14½ lbs., at 11d. per lb.; 25 ducks, at 4s. 3d. per couple.

Answers.—*A.* (1) £1,424 1s. 3d.; (2) £6 18s. 9d., + £1 14s. 3¼d. + 13s.6½d. + £3 0s. 11d. + £14 = £26 7s. 5¾d.; (3) $1\frac{19}{210}$; (4) £29,280.

B. (1) 1,248 eggs; (2) £146,025 13s. 9d.; (3) $\frac{37}{40}$; (4) £1 4s. 8d. + 10s. 9½d. + 17s. + £1 19s. 10½d. + £2 13s. 1½d. = £7 5s. 5½d.

Writing.—Passage dictated from Longmans' New Geographical Reader, No. V., page 167.

'The olive has a foliage that enables it to live for a long time without rain, and is therefore grown more largely in Spain than in any other country of Europe.

'But the southern slopes of the plateau and the lowlands are rich in trees and fruits of the most beautiful kinds. The orange, the citron, and the lemon are grown in large plantations; and evergreens, such as the olive and the cork-tree, cover the sides of the lower hills.

'In nearly all parts of the peninsula, agriculture can be carried on only by the aid of irrigation. The coast rivers, more particularly in the east, are largely made use of for that purpose. For their irrigation works the Spaniards are much indebted to a people called the Moors.'

STANDARD VI.

Arithmetic.—Specimen card.

(1) Find the value of 5·34 × $\frac{\cdot 05}{5}$ of £5.

(2) From ·625 of 2 guineas take $\frac{\cdot 05}{5}$ of £50.

(3) Find the cost of 6 tons 15 cwt. 3 qrs. if 15 tons cost 10 guineas.

(4) A and B go into business. A's capital is £1,575, B's is £2,425. How much will each receive from a profit of £2,000?

Answers. — (1) 5s. $4\frac{2}{25}$d.; (2) 16s. 3d.; (3) £4 15s. $0\frac{3}{10}$d.; (4) A £787 10s.; B £1,212 10s.

Composition for Standards VI. and VII.

Write an essay on—*A*, Animals that eat Flesh, or *B*, The Postman.

STANDARD VII.

Arithmetic.—Specimen card.

(1) If a pane of glass 9⅓ inches long and 6⅝ inches wide cost 10d., what would a pane 26½ inches long and 14¼ inches wide cost?

(2) I bought oranges at 5s. 6d. per hundred and sold them at 8 for 2½d. Find the loss per cent.

(3) If 25 francs = £1, and 100 centimes = a franc, express 375 francs 75 centimes in pounds, shillings and pence.

(4) A school consisted of 180 children: ¾ attended on Monday, ⅔ on Tuesday, all on Wednesday, ⅕ were absent on Thursday, and 121 attended on Friday. Find the average daily attendance.

Answers.—(1) 5s.; (2) $52\frac{33}{68}$%; (3) £15 0s. 7½d.; (4) 140.

Grammar for Standards V., VI. and VII.

The following lines were given for parsing and searching questions on Grammar and Analysis:—

'Lives of great men all remind us
We can make our lives sublime;
And, departing, leave behind us
Footprints on the sands of time—
Footprints that perhaps another,
Sailing o'er life's solemn main,—
A forlorn and shipwrecked brother,
Seeing, shall take heart again.'

Geography for same Standards.

Thorough questioning on the Southern countries of Europe, particularly the cities of Italy, and the productions of France, the Alpine region, and the rivers issuing from it.

How a Scotch School was Examined.

Music.—This was the first subject examined, and as the standards were large they were examined separately. The modulator test in the lower classes was not of much difficulty, as—Key C. **m s f e s d' t s m t, d r f l t r' d' s m d.** In the higher standards the pupils were tested as to their ability in changing the key, as—Key C. **f r s f e s d' 'd t l d t a l 'd s f e f r s d' t a l t d'** &c.

Songs were taken from every standard and the following ear tests were given.—**d m s; d s m; r f m; d' t l; d m s l s; d m r t, d.**

INFANTS.

The Books were Nelson's, and one sentence was read by each pupil: simple questions were asked on the matter read.

Writing.—Capitals K W M N X. Small letters k w m n x.

Arithmetic.—Entirely mental.—4 and 6? 7 and 3? 10 and 5? 5 and 6? 11 and 2? &c.

8 from 9? 7 from 11? 9 from 16? 6 from 19? 9 from 17? 4 from 15?

How many half-penny dolls for two pence?

How many penny books for a shilling?

How much left of a shilling after spending 11½d.?

Two action songs were sung and a very simple modulator exercise given.

Sewing drill taken from the girls.

STANDARD I.

Reading.—Books.—Nelson's Royal Star and Blackie's Graded Readers. One sentence was read by every *second* child and simple questions on the matter read were given to a section of this standard.

Writing.—*Two* lines were transcribed from the passage read.

Arithmetic.—(1) Add, Nine hundred and eighty-six; seven hundred and one; eight hundred and thirteen; nine hundred and twelve; and seven hundred and twenty-one. 4133. Ans.

(2) Add: Eight hundred; six hundred and forty; eight hundred and thirty-one; and two hundred and nineteen. 2490. Ans.

(3) From nine hundred and one take eight hundred and ninety-nine. 2. Ans.

Two songs were sung and a modulator exercise taken.

STANDARD II.

Reading.—Books—Nelson's Royal Star and Blackie's Graded Series. Every *third* child in the class read a sentence; questions were asked on the subject matter, and grammar so far as nouns and verbs are concerned was taken.

Copy books were not examined.

Dictation.—'When the dog died he was buried near his master; and the figure of a dog has been placed over a drinking-fountain in a street.'

Arithmetic.—(1) Add, Eight thousand nine hundred, three hundred and ten; seven thousand and nine; sixteen; eight hundred and ten; nine thousand and ten; ninety-nine, and eight. 26,162. Ans.

(2) From 890,010,896 take 798,100,988. 91,909,908. Ans.

(3) Multiply 8,917,846 by 4. 35,671,384. Ans.

Two songs were sung and a modulator exercise given.

Sewing for girls as per Schedule.

STANDARD III.

Reading.—Books—Nelson's Royal Star and Scottish Readers. Reading taken from the former, and every child read.

Intelligence tested from lessons read.

Grammar of nouns, verbs and adjectives taken, and *Analysis* of such sentences as, 'Just at that moment he was suddenly seized from behind.'

Repetition.—'After Flodden.' Nearly every one had to repeat.

Dictation (on paper).—'The snow was still falling and the night was very dark; but aided by the lights they had with them, the party pushed on into the wood. Lion ran forward, but he seemed to be at a loss, the new-fallen snow preventing him from getting any scent.'

Geography.—Principal towns and cities of Scotland, with short notes on the more important ones, such as Dundee, Edinburgh, Glasgow, Inverness, Oban, &c.

What is a piece of water surrounded by land?

Give different names for 'a Cape' in Scotland. Where is the Mull of Cantire? Mull of Galloway? Cape Wrath? Butt of Lewis? etc.

History.—Reign of Queen Mary from the beginning of her reign till her abdication, and then the details of her flight to England, of her imprisonment there and execution in Fotheringay.

Arithmetic.—*A.* (1) Multiply two hundred and fifty-six thousand eight hundred and five by four thousand two hundred and fifty. 1,091,421,250. Ans.

(2) Divide 5,609,912 by seventy-seven. 72,856. Ans.

(3) Divide 473,048 by 132 (using factors).
3583 + 92. Ans.

(4) Take 17s. 11¾d. from £2 1s. 7¾d.
£1 3s. 7¾d. Ans.

B. (1) Multiply four hundred and one thousand three hundred and ninety by three hundred and fifty-seven. 143.296,230. Ans.

(2) Divide 2,905,686 by forty-eight (using factors).
60,535 + 6. Ans.

(3) Divide 702,681 by 586. 1199 + 67. Ans.

(4) Find the difference between £583 5s. 6¾d. and £374 14s. 8½d. £208 10s. 10¼d. Ans.

STANDARD IV.

Reading.—Books—Nelson's Royal Star and Scottish Readers. Reading taken from the Royal Star Reader. Intelligence, Grammar and Analysis tested from the lessons read.

Dictation.—'The oak was held in great reverence by the ancient Britons. Their priests generally worshipped under its shade. When the oak leaves withered in autumn, sometimes an evergreen plant having white berries was seen hanging from a naked bough. This was the mistletoe; and its presence was regarded as a special mark of God's favour. On a day fixed, the priests cut down the holy plant.'

Geography.—Towns in Galway? A range of mountains in Ireland? Where are they? A river in Yorkshire? Its tributaries? Largest lough in Ireland? Towns in Kent? Towns in Glamorgan? What separates the Isle of Wight from Hampshire? Towns in Queen's County? &c., &c.

History.—When did James I. begin to reign? What was the Union of the Crowns? Give the date. What plots occurred in the reign of James? Tell all you know about them with dates. Any other important event in this reign? What was the civil war? When was the first battle fought? Where? Who were the leaders on each side? Name the principal ministers of Charles I.? What happened to them? &c.

Arithmetic. Specimen Card.—(1) Multiply nineteen pounds nineteen shillings and nine pence half-penny by three hundred and eighty-four. £7676 Ans.

(2) Divide three thousand seven hundred and fifty-seven pounds fourteen shillings and sixpence by three hundred and twenty-four.
£11 11s. 11½d. Ans.

(3) In a bag there are sovereigns, crowns, florins, threepences and half-pence, 240 of each; what is the value of the whole? £327 10s. Ans.

(4) Multiply 3 stones 3 lbs. by 36.
115st. 10 lbs. Ans.

STANDARD V.

Reading.—Books—Nelson's Royal Star No. 5 and Royal Scottish Reader. The reading was taken from the former.

Repetition.—'Gray's Elegy'—Four lines were asked from each of a dozen or so throughout the class and no questions on meaning taken.

Instead of a story ten lines were given for dictation:—'At this point of his narrative the old gentleman showed a number of hammers, such as were in use before he began to improve the instrument; and it was plain that men had tried very hard before him to overcome this difficulty. One hammer had an iron rod running down through the handle, with a nut screwed on at the end. Another was wholly composed of iron, the head and handle being all of one piece. There were various other plans, some of which were exceedingly clumsy and awkward.'

History.—The Inspector examined the class on 'The Spanish War,' 'War of Austrian succession,' 'Seven Years' War' and the 'Jacobite Rebellions.'

Geography.—Questions were asked on the general geography of Spain, rivers, towns, mountains, capes, and surrounding seas.

Arithmetic.—Specimen Card.—(1) Find by practice the value of 80 articles at £12 16s. 2d. each.
£1024 13s. 4d. Ans.

(2) Make out and receipt the following bill:—
3¾ lbs. tea at 1s. 10d. per lb.
17 lbs. sugar at 3½d. per lb.
78 loaves at 3s. 9d. per dozen.
24 boxes at 1s. 11d. per box.
(6s. 10½d. + 4s. 11½d. + £1 4s. 4½d. + £2 6s.)
= £4 2s. 2½d. Ans.

(3) A man paid £1 12s. as income tax; the tax was 7d. in the pound; what is the amount of his income? £54 17s. $1\frac{1}{2}\frac{6}{7}$d. Ans.

(4) Add $12\frac{1}{3}$, $3\frac{1}{4}$, $8\frac{1}{6}$, and subtract $14\frac{3}{8}$ from the answer. $9\frac{3}{8}$. Ans.

STANDARD VI.

Reading.—A lesson was read from Nelson's Royal Star Reader No. 6.

Repetition.—The 150 lines from the Lady of the Lake were repeated. Each one repeated the lines until the Inspector called 'next.' No intelligence was taken.

Analysis and Grammar were taken orally from sentences chosen by the examiner from the reading lesson.

Composition.—'A Holiday Ramble' or 'Your Favourite Pet.'

Geography.—South America; geography of Brazil principally; rivers, mountains, towns, productions, and character of the country.

History.—Chiefly confined to the Crimean and the Burmese wars, but the Inspector was very particular about the First Reform Act.

Arithmetic.—Specimen card.

(1) If 120 men do a piece of work in 180 days of 10 hours each, how long will it take 23 men to do the same, working 9 hours per day?
$1043\frac{1}{23}$. days. Ans.

(2) If $\frac{13}{15}$ of a cwt. cost £7 3s. what will $\frac{6}{11}$ of a ton cost? £90. Ans.

(3) Add together 2·095 hrs., ·07 of a day, and ·05 of a week, and express the sum as the decimal of 365·25 days. ·00138. Ans.

(4) Find the simple interest of £1230·4 for 2·75 years at 5·25 per cent. £177 12s. $9\frac{4}{25}$d. Ans.

Special Subjects.

French, 1st Stage.—(1) Give the feminine forms of frais, heureux, mon, riche, protecteur.

(2) Decline 'qui,' 'lequel,' 'celui,' 'je.'

(3) Write out the Imperf. Subj. of 'recevoir,' the Pres. Indic. (interrogative form) of 'aimer,' the Pluperf. Subj. (negative form) of 'finir.'

Latin, 1st Stage.—(1) Decline Deus, a god; domus, a house; idem, the same.

(2) Compare bonus, good; prudens, wise; liber, free; similis, like.

(3) Write out the Pres. and Fut. Indic., Active, and Passive of 'audio' to hear, and the Imper. Mood Passive of 'moneo,' to warn.

Mathematics, 1st Stage.—

(1) From $4a^2 + 6a^2b + 3d^2 - z^2$
Take $a^2 - 2(2a^2b + 2d^2) + 3z^2$

(2) If $a = 2$, $b = 4$, $c = 3$, $d = 1$, $e = 5$, find the value of $(a - 2b + 7c)^2 - (2c - 2d + e)^2$.

(3) If two angles of a triangle are equal the sides also which subtend or are opposite the equal angles shall also be equal.

Publications Received.

BELL, G., & SONS.—Natural Science Examination Papers (*R. Elliot Steel*).

BLACKIE & SON.—The Pet Readers. Nos. 1 and 2 (*Mrs. A. H. Garlick*).

CASSELL & CO., LIMITED.—The Citizen Reader.

CLIVE, W. B., & CO.—Matriculation Mathematics; Matriculation Latin; Ovid's Metamorphoses, XI., Text and Notes } Tutorial Series.

CURWEN & CO.—School Cantata: The Forty Robbers; Imperial Action Songs, Parts 1 and 2 (*Frederic James*).

DAWSON, A. G.—The Townley Standard Geography; The Townley Standard Practical Arithmetic, III. and IV., with Answers (*Beard*); The Scholar's Composition Aid (*Wood*); The Teacher's Mental Arithmetic, Standards I. and II. (*McNamara*).

FISHER UNWIN, T.—The Century Magazine. May and June.

HEYWOOD, JOHN.—Handbook to the Code Examinations, Standard V.

HODDER & STOUGHTON.—Hold the Fort (*Mary Prior Hack*).

HOULSTON & SONS.—The Beautiful Valley Sermons to Children. Nos. 13 and 14.

JOHNSTONE, W. & A. K.—The Unrivalled Atlas.

LAURIE, T.—Manual Training in Elementary Schools for Boys (*A. Sluys*).

LONGMANS & CO.—A Treatise on Spherical Trigonometry (*Casey*).

MACMILLAN & CO.—A Syllabus of Modern Plane Geometry.

MISCELLANEOUS.—Home Rule and Federation (*Truelove*); H. Llewellyn Smith's Report *re* Scotch Education (*National Association for the Promotion of Technical Education*).

PHILIP, G., & SON.—Compound Addition Tests (*Michael Power*); Elementary Mensuration (*S. Pedley*).

PITMAN, J., & SONS.—Phonographic Dictionary; A Complete Guide to the Improvement of the Memory (*Rev. J. H. Bacon*).

SMITH, ELDER & CO.—The Cornhill Magazine. May.

University of London.

EXAMINERS AND ASSISTANT EXAMINERS FOR 1889—90.

Latin.—J. S. Reid, Esq., Litt. D., M.A., and Prof. R. Y. Tyrrell, D. Lit., LL.D., M.A.
Greek.—Rev. H. A. Holden, LL.D., M.A., and Rev. W. Wayte, M.A.
English Language, Literature, and History.—Prof. Ed. Arber, F.S.A., and Prof. J. W. Hales, M.A.
French Language and Literature.—Amédée Esclangon, Esq., and J. A. Leriche, Esq., B.A., B.Sc.
German Language and Literature.—Prof. C. A. Buchheim, Ph.D., and Herman Hager, Esq., Ph.D.
The Hebrew Text of the Old Testament, the Greek Text of the New Testament, the Evidences of the Christian Religion and Scripture History—G. J. Spurrell, Esq., M.A., and Rev. C. H. H. Wright, D.D., Ph.D., M.A.
Mental and Moral Science.—Prof. Robt. Adamson, LL.D., M.A., and Prof. Wm. Knight, LL.D.
Political Economy.—Prof. C. F. Bastable, M.A., and Prof. J. S. Nicholson, D.Sc., M.A.
Mathematics and Natural Philosophy.—Prof. M. J. M. Hill, M.A., and Joseph Larmor, Esq., D.Sc., M.A.
Experimental Philosophy.—Prof. G. F. FitzGerald, M.A., F.R.S., and R. T. Glazebrook, Esq., M.A., F.R.S.
Chemistry.—Prof. H. E. Armstrong, Ph.D., F.R.S., and Prof. N. A. Tilden, D.Sc., F.R.S.
Botany and Vegetable Physiology—Prof. F. Orpen Bower, D.Sc., and Prof. H. M. Ward, M.A., F.R.S.
Comparative Anatomy and Zoology.—Sydney J. Hickson, Esq., D.Sc., and Adam Sedgwick, Esq., M.A., F.R.S.
Geology and Palæontology.—Prof. W. Boyd Dawkins, M.A., F.R.S., and Prof. Chas. Lapworth, LL.D., F.R.S.
Physiology.—J. N. Langley, Esq., M.A., F.R.S., and Prof. E. A. Schäfer, F.R.S.
Music.—William Pole, Esq., Mus. Doc., F.R.S., and Sir Jno. Stainer, Mus. Doc., M.A.

Publications Reviewed.

School Management and Method. By John J. Prince. London and Manchester: John Heywood.

This is said to be the fifth edition of this book, revised and much enlarged. That being the case, it is a pity that revision did not extend to every part of the book. It is written, we are told, for persons intending to sit for government certificates or at the Scholarship examination, as well as for teachers and pupil teachers. Such persons require accurate information, brought up to the present date.

On the very first page however we meet with statements of requirements different from those insisted upon by the Education Department. For example, in the 'Rules to be observed in planning and fitting up Elementary Schools' issued by the Department, we are told, 'The proper width of a schoolroom is 18 to 20 feet (according to length) or 22 feet.' The writer of this book says, 'If to accommodate 200 children it would be much the best to increase the width to about 28 or 30 feet.' Again this book says, 'Its height should never be less than 14 feet,' while the Department says, 'The walls of every schoolroom and class-room . . . must be at least 12 feet high . . .' Another paragraph says, 'It is decidedly beneficial to have skylights.' The Department says, 'Skylights are objectionable and should *never* be resorted to where windows are possible.' In chapter II. the writer deals with the furniture of the school, but makes no mention of the 'dual desk' which is a requisite of the Department in certain schools. The Examination Schedule and Form IX. have been changed materially since those of which part is

inserted were in use. The other parts of the book are equally open to objection. It would be utterly absurd, for example, for any teacher to begin lessons on Grammar with such an example as is given on page 147. Chapters are given on discipline, the method of teaching various subjects, and on sanitary science as applied to schools. Part IV. deals with mental science in its bearing on child training. Upwards of 100 pages are devoted to questions given on various occasions, with special answers to a large number. The matter of the author is often marred by incorrect or peculiar expression. Nearly every page is defective in this respect. Here are some examples, taken at random from among thousands: 'There should be a porch or lobby to enter the school' (p. 8). 'Regarding the windows, each should be fitted with blinds' (p. 9). 'The whole school is engaged on each of these groups at the same time' (p. 17). '. . . the elements it is made with' (p. 110). 'The next class of exercise which should be introduced are relating stories' (p. 156). 'Illustrations should be given to the teacher' (p. 226). 'The stronger feelings, when *fully* excited, *gradually* rise' (p. 227). Another feature is the frequent use of the form '&c.' which is found hundreds of times in the book. The writer, too, has a habit of degenerating into the lecturing style, using the second person in addressing his reader. We cannot recommend the book either for its method or matter.

Longmans' Drawing Books. London: Longmans, Green and Co., Paternoster Row.

The series consists of fifteen books prepared for the various Standards in accordance with the illustrated syllabus of the Science and Art Department. It is issued on good paper with clear, well-defined and accurate figures, generally well-graduated, and in the earlier copies with numerous aids in the shape of dotted lines, guiding lines, and other requisites for correct drawing by young pupils. Most of the freehand designs are original. The books are issued in sizes to suit the subjects and standards, and are so arranged that one book serves for each subject. A large blank book for the drawing to scale of the fourth, and the geometry of the fifth, sixth and seventh standards, forms part of the series. The other books contain drawing copies, and space for the student to draw.

School Examination Series: General Knowledge Examination Papers. Compiled by A. M. M. Stedman, M.A. London: George Bell and Sons.

Collections of Examination Questions may serve two or three useful purposes. They may indicate to teachers the standard and type of question which boys preparing for examination are expected to answer. They may be used by teachers as tests of their teaching, and as preliminary practice for boys about to be examined. And further they may suggest to teachers subjects and special points to be attended to in their courses of instruction. It is, we think, for the latter purpose that this extensive collection of general knowledge papers is likely to be most generally useful, though they may also be serviceable in the other ways mentioned. It is undoubtedly important that boys and girls should be well informed on general subjects; but the range of these questions is wonderfully wide, and if any young person could be found able to answer them all, he would be either an 'Admirable Crichton,' or (a more probable case) the most veritable of prigs. Science, art, history, ancient and modern, language, literature, politics, scripture, all are included under the term 'general knowledge.'

A few of the papers have been actually set at some of the Colleges of Oxford, but most of them are specially compiled for this work. To show the nature of the questions we quote some from an early paper: 'Why is farming less profitable in England than it was?' 'Give some account of the feudal system.' 'Explain the following proverbial expressions, giving, if possible, their origin:—To turn the tables on any one, to cross the Rubicon, Hobson's choice, to out-Herod Herod, a Cadmeian victory, to pay the piper, a Roland for an Oliver, a nation of shopkeepers, to dine with Duke Humphry.' 'Name the chief imports and exports of Britain.' 'How would you spend a present of £3 in books?' 'Why do most leaves turn colour in the autumn?'

Here is a rather comprehensive question from a paper of ten questions set at Trinity and Wadham Colleges: 'State what you know of Machiavelli, Catherine de Medici, Smeaton, J. S. Mill, Condé, indirect taxation, proportional representation, euphuism, University extension, Chiltern hundreds, miracle plays.'

The book is well arranged and clearly printed, but we notice one or two misprints, as Molke for Moltke on page 9 Chanchellor for Chancellor on page 17.

A Manual of Cursive Shorthand. By Hugh L. Callendar, B.A. London: C. J. Clay and Sons.

In an introduction, which we may fairly call lengthy, since it occupies more than third of the volume, the author of this manual lays down, in an interesting and well-reasoned manner, the conditions of a satisfactory system of shorthand. He takes occasion to subject Mr. Pitman's Phonography to a searching and somewhat severe criticism, and appears to consider this most popular system wanting to a considerable extent in all the most important conditions of success,—in facility and clearness, in simplicity, in legibility, and in brevity. For the new system he claims that it is easy to write, simple to learn, easy to read, and as brief as is compatible with the above conditions. The chief grounds on which these claims are based are that the characters are only to a limited extent geometrical; that the elementary forms used in ordinary script are made use of; that only two sizes of character are used; that distinctions of thick and thin strokes are avoided; that vowels are written in their proper order by joined characters instead of by detached dots or marks; that the same sound cannot be written in more than one way; that the system is phonetic and alphabetic, and includes unmistakable means of indicating vowel sounds and accents. The arguments, as we have intimated, seem good, but in a matter of this kind the saying will properly apply, that 'the proof of the pudding is in the eating.' It is only by practice that the comparative merits of this or any system can be thoroughly established.

The manual includes a full explanation of the characters used, general directions for writing, a number of specimens of writing, an account of legitimate methods of abbreviation, an alphabetic list of common words, and a series of progressive writing exercises. Without specially engraved characters or cuts we could not illustrate the system, but we commend it for examination to those who may be in search of a system of shorthand suitable for general and educational purposes, or those who having already learnt some other system find it unsatisfactory. The exercises consist of words classified to illustrate particular elements, combinations, and difficulties. There should be more exercises for graduated practice in reading, in imitating, and in translating from longhand into shorthand.

A Complete Grammar for Pupil Teachers and Middle Class Schools. London: Bemrose and Sons.

This Grammar is like all books made up in sections which are written for another purpose—unsatisfactory. It consists of the Jubilee Standard Grammars IV.—VII., with added matter. As a consequence, there is need for recapitulation on several occasions. There are insertions of pieces of poetry for repetition, with notes and meanings, which have no place in a grammar proper. The history of the language is contracted into ten pages, most of which are occupied by a list of writers and their works,

and the student is referred to other parts of the book for matter which rightly belongs to this section. The word 'Lesson' is retained at the head of many sections, yet without any number, while over many other sections, which are equally lessons, it is wanting. The different parts of speech are treated very unequally. For example, the first eight pages treat of the noun, pronoun, adjective, verb and adverb. There is not a single exercise on the first four parts of speech, while two whole pages form the first exercise, which is devoted solely to the adverb. This is only one of the results which follow the practice of binding together books written for a specific purpose. Of course the noun, verb, adjective and pronoun were treated of in the Jubilee Standard Grammars II.—III., but these are not incorporated. The book is, therefore, not a 'Complete Grammar,' and cannot be recommended either to pupil teachers or head teachers as such. We have marked many passages also in which either the mode of expression is peculiar, or the grammar is defective, but sufficient has been said to show the unsuitability of the title to the book, as well as the want of method in arrangemement. There is matter in the book suitable for a grammar for schools, which the publishers might utilise in a different form.

The Dickens Reader: London: Blackie and Son.

The latest volume of Messrs. Blackie's series of special readers for the upper standards is a favourable specimen of a type of reading book which we have often commended in these columns. The Dickens Reader begins with a number of interesting readings on the life of the famous author. Then follow several passages selected from the Pickwick Papers, some from the Life and Adventures of Nicholas Nickleby, twenty readings from Oliver Twist, and the whole of the favourite Christmas tale, the Cricket on the Hearth, divided into twenty-seven sections. Good judgment is shown in the selection and editing of the extracts, which are well calculated to give young readers a good idea of the style and character of some of the works of one of the greatest modern masters of human pathos and healthy English humour. The continuity of interest which belongs to connected stories may further help to develop that love of reading which leads many young people to adopt it as a pleasant form of mental recreation, and so keep up their reading practice, without which a power acquired with difficulty is apt to be speedily lost with ease. A list of the more difficult words, placed in the order of their occurrence in the lessons, is to be found near the end of the book, and this list is followed by another with meanings of words and phrases. The book is well-printed and neatly bound.

Natural Science Examination Papers. Part I.: Inorganic Chemistry. By R. E. Steel. London: G. Bell and Sons.

We have here a book of 166 pages, containing more than a thousand questions on Chemistry. The first section contains questions on the elements and ordinary compounds. A set of test papers are given. The questions for the last few years of the following public examinations are printed :—College of Preceptors; London Matriculation; Science and Art Department; Preliminary Scientific; Intermediate Science, London; Oxford Local, Junior; Cambridge Local, Junior; Oxford Local, Senior; Cambridge Local, Senior; Cambridge Higher Locals; Oxford and Cambridge Examination Board; Sandhurst; Woolwich; Oxford and Cambridge Schools Examination Board; Civil Service Clerkships.

The second section is devoted to questions upon practical inorganic chemistry. The origin of these questions is not stated. There can be no question about the usefulness of the papers we have referred to. A teacher often wants to gather the general character of the examination for which he is preparing his pupils. It does not, however, occur to us that the questions upon the elements and the chief compounds can be of much service to good teachers. We take a few at random. 'In what condition is carbon found free in nature? Explain how wood and animal charcoals are made. What is coke and how is it formed? What is amorphous carbon, and what does amorphous mean? What does allotropic mean? How can it be proved that the diamond consists of almost pure carbon?' Questions like these would occur to any teacher, and there seems no need to write a book full of them. There are a number of purely arithmetical examples: there are, however, no answers to these. That seems to be a great omission. A teacher may as well dictate his own. He would gain nothing by first looking for an example, and, when he had found it, having to calculate out the answer. In a second edition we hope answers to all the numerical exercises will be included.

The Standard Reciter. Dublin: Thom and Co., Middle Abbey Street.

This consists of ten little penny books, each of sixteen pages, and containing a good selection of old favourites from English poetry. They are not selected with a view to the pieces being just suited in length for the various Standards, but for their value as poetry. A sort of graduation, however, has been attempted, and, as a rule, the earlier numbers contain the easier pieces. Teachers will find in them a good selection for all the Standards for repetition at the annual inspection, and for recitation at school entertainments.

University College Tutorial Series. — Ovid: Metamorphoses XI. Cambridge: W. B. Clive & Co.

This consists of an introduction on the life and works of Ovid, an analysis of the eleventh book of the Metamorphoses, and an account of the metre in which it is written. We then have the text, which is followed by a very full and useful set of notes. This seems to us a very useful edition, which will supply, we believe, nearly exactly what the pupil wants, and we have great pleasure in recommending it.

Matriculation Latin. By J. B. Hayes.

This is another book in the same series. It contains eight chapters, and is really full of advice and useful hints. We have a very strong opinion that nobody can teach himself to write Latin prose. It is one of those subjects which perhaps as much as any other, certainly more than most others, needs the instruction of a living and competent teacher. Nevertheless, a diligent and clever lad can do very much for himself with such help as this book will afford him, even in the matter of writing a Latin sentence grammatically. So far as the grammar is concerned, a candidate need fear no ordinary tests if he has followed the course recommended in this book.

Matriculation Mathematics.

We have here a beautifully printed, neatly bound volume of about 100 pages, devoted to the Mathematics of the London Matriculation Examination. It consists of eight chapters: these contain hints for candidates, choice of books, and weekly scheme of study, test papers, miscellaneous questions, selected examples, answers and solutions to papers set at the Matriculation Examinations from January, 1887, to January, 1889. A book like this speaks for itself. In the way of guides to the Examinations of the London University, the University College Tutorial Series seem to have developed a speciality, and so far as we can see have outstripped all their rivals.

New Paragon Arithmetical Tests: Standard II. London and Manchester: John Heywood.

Ninety-six tests of four sums each for Standard II. for a penny. The tests are good and suitable, and may be used with advantage towards the end of the school year.

The Merit Primers I. and II. Infant Reader. Dublin: Alex. Thom and Co.

These three little books gradually introduce the pupil to the mysteries of reading. The first Primer contains lessons chiefly on short vowel sounds, although some lessons on the long vowel sounds are introduced, we think much too early, as few lessons are based upon them. In the first Primer there are no illustrations, and the capital letters are deferred to the second Primer, which has several cuts. Each lesson introduces a new combination of consonants, and the story of which it consists contains as many examples of this combination as possible. The same plan is continued in the Infant Reader, so that, before coming to the end of the three books, most of the forms found in words of one or two syllables have been met with. The type, paper and matter are good, and, on the whole, suitable, but the spacing in the second Primer varies, and many of the pages not being filled up gives the book a somewhat unfinished look. We can recommend them as suitable for infant schools.

Cassell's Modern School Series: The Citizen Reader. By H. O. Arnold Forster. New Edition. London: Cassell Company, Limited.

The publishers of the Citizen Reader seem determined to keep this popular school-book abreast of the times. The new features in the most recent edition are two chapters on the County Councils and their work, an additional coloured plate illustrating the modern form of war-ship, and a stronger kind of binding adapted to resist rough usage. The added chapters are in the same clear and simple style we have commended in previous notices of a work which we rejoice to find has achieved a success so genuine and so well-deserved.

Cornhill Magazine. London: Smith, Elder and Co.

This leading magazine still maintains its high character. 'Rights and Lefts' in the May number should be read by every teacher; it is quaint and instructive. The fiction leaves nothing to be desired.

The Century Magazine. London: T. Fisher Unwin.

As usual the illustrations in this periodical are of exceptional excellence. Mr. George Kennan's articles on Russia and the treatment of her political prisoners reveal a state of things almost incredible. Some of them are heart-rending. The contributions are varied and interesting. 'King Solomon of Kentucky,' in the June number, is a well-drawn sketch, and 'Certain Forms of Woman's Work for Woman,' is not only suggestive and valuable, but appears most opportunely.

We wish the *Century* every success on this side of the water.

General Atlas of Modern Geography. Edited by S. W. Bacon. London: Bacon and Co., 127, Strand.

We have pleasure in calling the attention of our readers to this handsome Atlas, just issued by the Messrs. Bacon. All the latest geographical discoveries have been embodied in the work, which is further enriched by a gazetteer of a thousand of the chief towns of the world, and an alphabetical index. The maps are beautifully printed, and not overcrowded with names. This new candidate for popular favour deserves to succeed. It is produced in admirable style.

We regret to say that by an oversight several copies of our last issue were sent out imperfect. Subscribers who have received these may have them exchanged for perfect copies upon application.

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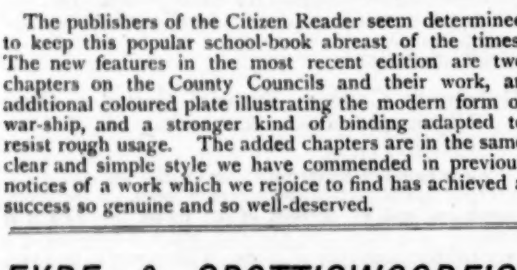

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